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REPORT ON POLLUTION OF THE CHATTAHOOCHEE RIVER, ALABAMA-GEORGIA

A. W. West

Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

January 1966

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REPORT ON

POLLUTION OF THE CHATTAHOOCHEE RIVER

Alabama-Georgia

by A. W. West
Public Health Engineer

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

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INTRODUCTION

Stream surveys and investigations of water uses, sources of wastes, and effects of pollution on water quality and uses were conducted along the Chattahoochee River in 1964 and 1965 to determine whether pollution originating in Georgia or Alabama endangers the health or welfare of persons in a state other than that in which the discharge or discharges originate.

This report on pollution of the interstate waters of the Chattahoochee River is based on stream surveys directed by the United States Department of Health, Education and Welfare and upon information provided by the Georgia Water Quality Control Board, the Georgia Department of Public Health, the Alabama Water Improvement Commission and municipalities in Georgia and Alabama.

The Georgia Water Quality Control Board and the Georgia Department of Public Health provided the essential information describing sources of wastes and status of treatment in Georgia communities. The Georgia Department of Public Health analyzed many bacteriological samples collected by the Public Health Service during the October-November 1964 survey. The Alabama Water Improvement Commission furnished complete data from their 1961-1962 on-site investigations of

sewage and industrial waste loads from municipalities and industries in the Lanett-Fairfax-Langdale-Riverview area. Valuable information describing the sewerage systems and treatment works were provided by city officials in Atlanta and Newnan. Similar information, including sewage treatment plant operating logs and data sheets were provided by officials in Columbus, Phenix City, and Fort Benning. Representatives of the Georgia Power Company and the U. S. Geological Survey provided river discharge data.

The description of river water quality is based on the results of two field investigations conducted specifically for this purpose.

The first survey, extending from the Georgia Highway 92 bridge, about 20 miles below Atlanta, to the upper part of Lake Harding, was conducted from October 19 to November 6, 1964. Bacteriological, chemical and biochemical tests were run on one-per-day spot samples collected from ten locations along the Chattahoochee and from a single location in each of three tributary creeks. Representatives of both the Georgia Department of Public Health and the U. S. Public Health Service participated in this cooperative survey.

The second survey, conducted by U. S. Public Health Service personnel from June 28 to July 3, 1965, extended from Columbus, Georgia into the Walter F. George Reservoir. Total coliform, fecal coliform, and Salmonella bacteria examinations were made on river and reservoir waters, and sewage treatment plant effluent samples. During this bacteriological survey, river water samples were collected at 8-hour intervals, around-the-clock, during five successive days. Dissolved oxygen and temperature were

determined at various depths in the reservoir and a dye study was conducted to determine the flow time from Columbus to River Bend Park. A survey team from the Mead Corporation participated in the dissolved oxygen and time of travel studies and assisted Public Health Service personnel during field operations.

Data from other reports and special surveys were also used to supplement information gathered during the two general surveys in the Atlanta-Lake Harding Reservoir and the Columbus-Walter F. George Reservoir areas.

The Georgia Water Quality Control Board and the Alabama Water Improvement Commission conduct active water pollution control programs within their respective states. Their accomplishments have been many, and specific information regarding official action, progress and attainment of pollution abatement goals by the states, and by municipalities and industries within the states, can be obtained directly from these two state agencies.

The generous assistance provided by representatives of Federal, state, and municipal agencies and industry, and Public Health Service personnel in the Atlanta Regional Office and the Robert A. Taft Sanitary Engineering Center in Cincinnati, is deeply appreciated and gratefully acknowledged.

THE AREA

The Chattahoochee River is one of the major interstate rivers of the Southeast. Rising in northern Georgia, it flows southwest to West Point and Lanett and then forms the boundary between Georgia and Alabama as it flows south into the Apalachicola River in Florida.

The 225 mile reach of the river considered in this report extends from Atlanta to Fort Gaines, Georgia. Of this reach, 100 miles are in Georgia and 125 miles form the boundary between Georgia and Alabama.

The Walter F. George Reservoir below Columbus is the largest of 10 impoundments which have been created by power, navigation, or flood protection dams within this reach. Filled in 1962, the Walter F. George Reservoir extends 85 miles upstream from Fort Gaines to Columbus, covers 45,000 acres, forms 515 miles of shore line, and is used extensively for boating, fishing, water skiing, and general recreation. Cottages and homes have been constructed along the shores of the much smaller Lake Harding, which was formed by the Bartletts Ferry Dam below West Point and Lanett. An additional large reservoir extending 35 miles upstream from West Point toward Atlanta, with an additional 23,500 acres of potential recreational water and more than 100 miles of water front shore line, is being planned.

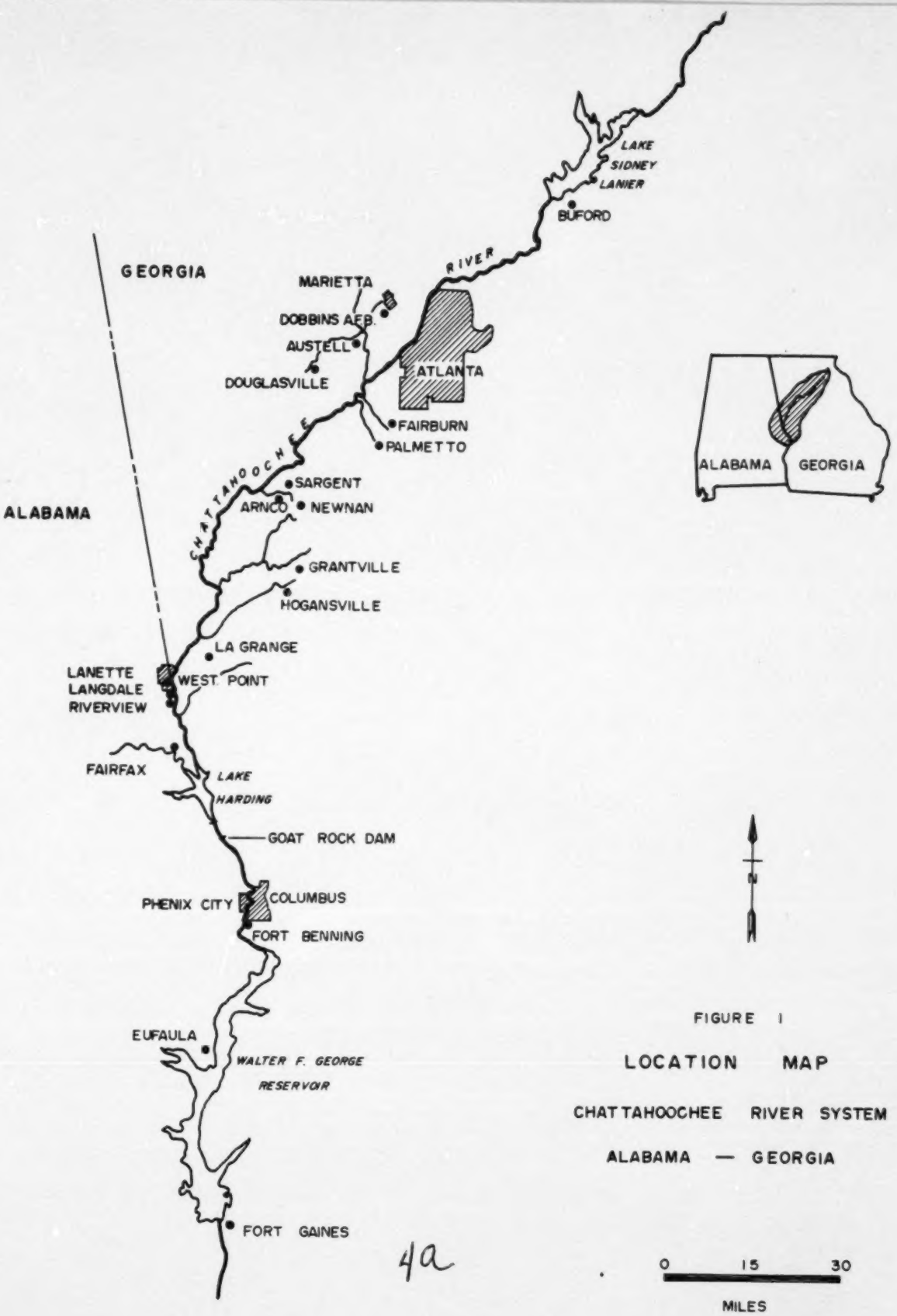

FIGURE 1

LOCATION MAP

CHATTAHOOCHEE RIVER SYSTEM

ALABAMA — GEORGIA

4a

Atlanta is the largest city on the Chattahoochee River. Numerous subdivisions in the Atlanta Metropolitan Area with a total population of 1,200,000 are served by Atlanta city sewers. The City of Atlanta is located astride a natural divide separating the Chattahoochee and Flint River basins and approximately one half million persons reside in areas connected to Atlanta city sewers draining to the Chattahoochee River Basin. This report discusses only that portion of sewage and industrial waste draining to the Chattahoochee River Basin. Columbus, with approximately 150,000 persons, is the second largest city in the surveyed area.

An additional quarter million people live in smaller communities located along tributaries and the main stem of the river.

Future growth and development of this region depends upon protection and preservation of this valuable resource - The Chattahoochee River.

WATER USES

More than a million people drink treated Chattahoochee River water. Industry depends upon it as a source of process and cooling water. Dams harness the river to produce electric power and ever-increasing numbers of people enjoy the impounded reservoirs for water sports and relaxation. It is also the receptacle for industrial wastes and treated and untreated municipal sewage.

One hundred and fifty million gallons of river water per day are used by the nine domestic water supply systems listed in Table 2. Of this total, more than one half (83 MGD) is used in Atlanta, 26 MGD in DeKalb County, 18 MGD in Columbus, 14 MGD in Cobb County and less than 2.5 MGD each in Gwinnett County, LaGrange, West Point, Lanett and Phenix City. Approximately 25 MGD of this total is withdrawn from the Chattahoochee River downstream from the Atlanta City sewer outfalls. DeKalb, Cobb and Gwinnett County, and the City of Atlanta water supply intakes are located upstream from Atlanta, and are not affected by sewage from Atlanta and other downstream communities.

Additional river water is used by diversified industry in Atlanta and the textile mills in La Grange, Lanett and Columbus. Initially, the proposed Alabama Kraft Company mill, to be located along the shore of the

Walter F. George Reservoir at Mahrt, Alabama, will use about 12 million gallons of reservoir water per day in the production of Kraft paper liner board.

More than 400,000 kilowatts of electric power are generated at 10 hydroelectric power dams located between Buford, Georgia, and Ft. Gaines, Alabama (Table 3). Three steam-electric power plants; the Atkinson and Jack McDonough plants of Atlanta and the Yates Plant at Yates, Georgia, circulate 1,400 million gallons of river water per day through their condensers while producing 1,280,000 kilowatts of electric power. The combined cooling water volume demand of the adjacent Atkinson and Jack McDonough plants at times exceeds the total Chattahoochee River discharge during the low flow seasons of the year.

People fish along many miles of the river proper, but the most intense recreational use occurs in the impounded reservoirs. Homes and summer cottages have been built along the shores of Lake Harding, below West Point and W lter F. George Reservoir below Columbus. Boat landings, marinas, and public parks flourish during the summer recreational season. Thousands of natives and tourists alike fish, swim, boat, and water ski in these waters, particularly in Walter F. George Reservoir. When the proposed dam is constructed above West Point, a vast new reservoir will be available for water-oriented recreation along the Chattahoochee River.

SOURCES OF WASTES

GENERAL

Both sewage and industrial wastes contain a variety of obnoxious constituents which can damage water quality and restrict its use. Oxygen-demanding materials can limit or destroy fish, fish food organisms, and other desirable aquatic life by removing dissolved oxygen from the river. Greasy substances can form objectionable surface scums, settleable solids can create sludge deposits, and suspended materials can make once attractive waters appear turbid and dingy.

Industrial wastes may also contain additional objectionable chemicals and toxic substances that can kill aquatic life, taint fish flesh, or promote slime growths in the receiving waters. Heat from steam-electric generating plants can magnify the adverse effects of other decomposing wastes and, if excessive, can injure or kill fish and aquatic life.

Sewage contains astronomical numbers of intestinal bacteria which were released in man's excretions. Some of these may be pathogens which can reinfect man.

The oxygen demand of sewage and industrial wastes, as measured by the 5-day Biochemical Demand test, indicates their potential for reducing the dissolved oxygen content of the river waters. The coliform bacteria

content of raw and treated sewage indicates the density of sewage-associated bacteria, which may include disease-producing pathogens, discharged to the river. The oxygen-demanding loads are expressed as population equivalents (PE) of 5-day biochemical oxygen demand (BOD) and the bacterial loads are expressed as bacterial population equivalents (BPE) of total coliform bacteria. Each PE or BPE unit represents the average amount of oxygen demand or coliform bacteria normally contained in sewage contributed by one person in one day. (One PE equals one-sixth pound per day of 5-day BOD and one BPE equals 400 billion coliform bacteria per day).

The amount of such pollutional constituents in sewage that can be removed by sewage treatment works depends upon the type and capacity of the plants, and the skill of the operators. Types of sewage treatment plants in this area are identified as primary or secondary; with or without chlorination.

Primary treatment plants, which consist essentially of settling tanks and sludge digesters, can remove most of the scums and settleable solids, about one-third of the oxygen-demanding BOD, and approximately 50 per cent of the bacteria. Secondary plants consist of primary units; plus secondary biological treatment units, such as trickling filters, activated sludge or oxidation lagoons. Such plants can remove about 80-95 per cent of the BOD and coliform bacteria. Chlorination facilities for disinfection of properly treated sewage plant effluents can destroy more than 99.9 per cent of the sewage bacteria. To accomplish these reductions, however, treatment facilities must be properly designed, adequately sized, and skillfully operated.

Raw and treated sewage from 26 cities and communities, untreated wastes from nine separate industries, and heat from three steam-electric generating plants are discharged to the surveyed reach of the Chattahoochee River watershed covered by this report.

BACTERIAL LOADS (SEWAGE)

Almost one-half million (476,645 BPE) population equivalents of coliform bacteria were discharged to the surveyed area of the Chattahoochee River watershed. Less than one-half (46 per cent) of the bacteria in the sewage from 883,100 persons residing in this area were removed by treatment.

The proportionate bacterial loads discharged by individual municipalities are illustrated on Figure 2, and tabulated in Tables 4 and 5.

Atlanta, Georgia

More than half (59.3 per cent) of the entire sewage-associated bacterial load entering the river was discharged from Atlanta.

Atlanta, with a sewered population of almost one-half million persons (485,100) residing in the Chattahoochee River Drainage Basin, operates five primary sewage treatment plants without chlorination. These plants remove an estimated 42 per cent of the coliform bacteria, but discharge approximately 282,400 bacterial population equivalents to the river.

About 80 per cent of Atlanta's sewage is treated at the overloaded Clayton Plant where approximately 62 million gallons per day (MGD) of sewage reaches this plant which was designed to handle only 42 MGD. Sewage flows exceeded the plant capacity more than 25 per cent of the time in 1964, and for 2,400 hours part of the raw sewage was bypassed to the river without treatment. Additional raw sewage from combined storm and sanitary sewers

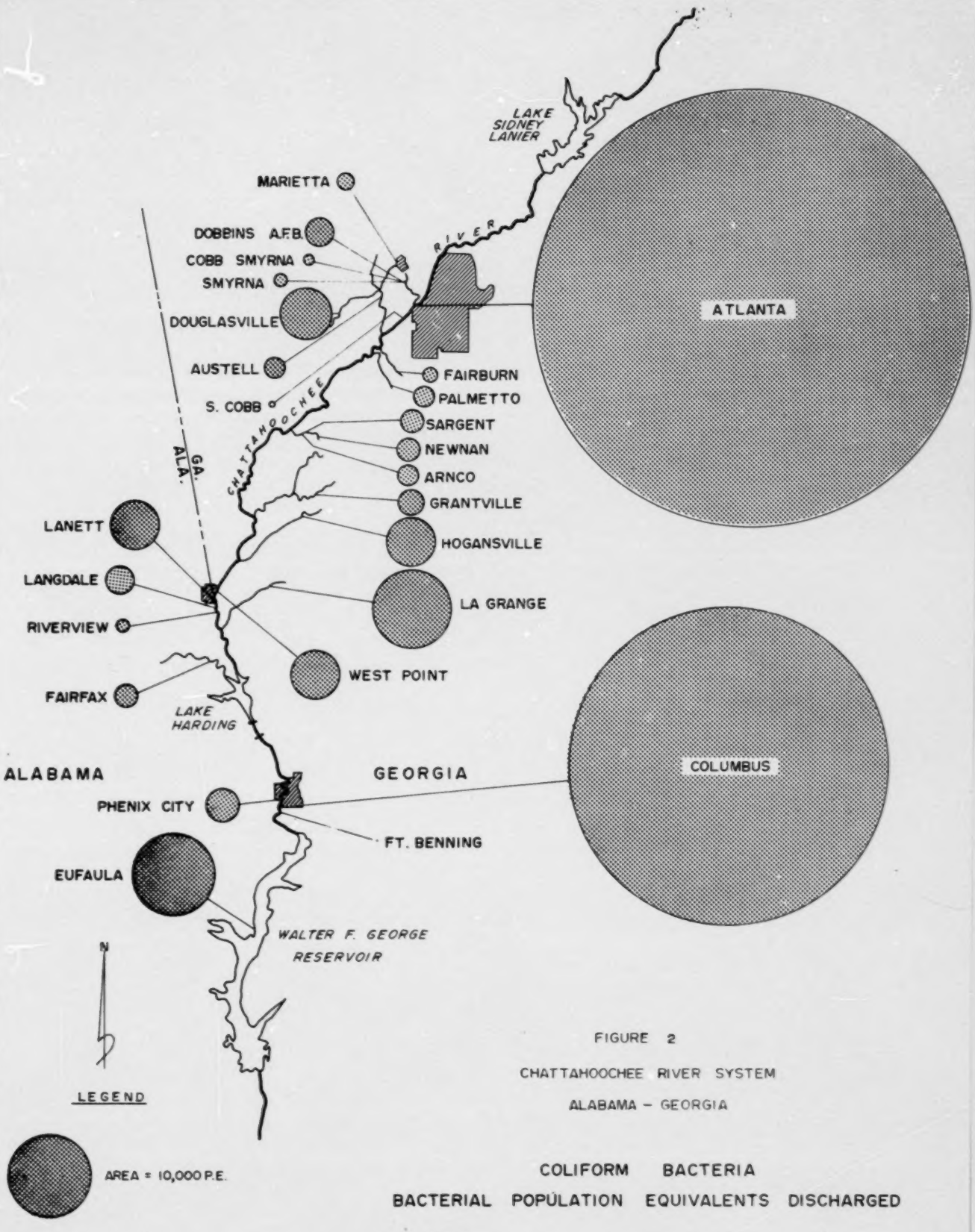

FIGURE 2

CHATTAHOOCHEE RIVER SYSTEM

ALABAMA – GEORGIA

COLIFORM BACTERIA

BACTERIAL POPULATION EQUIVALENTS DISCHARGED

reaches the river during periods of heavy rainfall.

Columbus, Georgia

The second largest bacterial load wzs discharged by Columbus, Georgia. Untreated sewage from 118,000 persons, plus the residual 32,000 BPE from the new primary sewage treatment plant, totaled 150,000 BPE, or 31 per cent of the total load to the watershed. The treatment plant effluent is not chlorinated and during the June 1965 survey, 220,000,000 total coliform bacteria per 100 ml were measured in the treatment plant effluent.

All of this sewage entered the headwaters of Walter F. George Reservoir, which is used extensively for water contact recreation.

Approximately 6.0 million gallons per day (MGD) of sewage was treated in the new 25 MGD capacity Columbus primary sewage treatment plant during the June 1965 survey. Upon completion of the interceptor system, an additional 14.0 MGD of sewage will be treated in this plant but final effluent chlorination facilities have not been provided to disinfect the effluent.

Approximately 0.5 MGD of untreated sewage which entered the river from a midwestern part of the city, and the discharge from a 15-inch sewer interceptor, which entered the river south of the primary plant, are outside of the sewered areas served by the existing primary and proposed secondary treatment plants.

Cobb and Douglas Counties

Approximately 100,000 persons reside in sewered areas of nine communities located west of Atlanta and across the Chattahoochee River,

in Cobb and Douglas counties. Ninety-four per cent of the coliform bacteria from this area were removed by treatment, leaving a residual of 6,630 BPE entered the river.

Marietta, Cobb-Smyrna, Smyrna, and South Cobb county each operate secondary plants with effluent chlorination. Dobbins Air Force Base and Cobb County subdivisions operate secondary plants without chlorination, and Douglasville and Austell operate primary plants. Individual bacterial loads from each of these plants are shown on Figure 2 and in Tables 4 and 5.

Eighty-five per cent of the total coliform load entering the streams in this area is attributed to the effluents from those treatment plants, especially the primary units, that lack chlorination facilities. Secondary plants with chlorination facilities are assumed to provide satisfactory removal of sewage bacteria.

Between Atlanta and West Point

Approximately 44,000 persons reside in sewered areas of the eight communities between Atlanta and West Point. Treatment plants, none of which include effluent chlorination facilities, removed 65 per cent of the coliform bacteria and the residual 15,280 BPE was discharged to tributaries of the Chattahoochee River.

Fairburn, Newnan, and La Grange operate secondary plants. Palmetto, Arnco, Sargent, Grantville, and Hogansville operate primary plants. Eighty-five per cent of Hogansville sewage and 22 per cent of La Grange sewage was discharged without treatment. These plants, the secondary units that lack chlorination, and especially the primary units that are outmoded or overloaded, do not provide effective bacteriological treatment.

At La Grange a new high rate trickling filter plant is under construction to treat the sewage which formerly entered Yellow Jacket Creek untreated.

West Point and Lanett Area

Untreated sewage from West Point, Georgia (population 3,900) is discharged directly into the Chattahoochee River only one mile upstream from the Lanett, Alabama municipal water works intake.

Untreated sewage from Lanett, Langdale-Shawmut, and Riverview, Alabama, also enters the river without treatment. Effluent from the ineffective Fairfax, Alabama, Imhoff tank is discharged to the Osanippa Creek, tributary of the Chattahoochee River.

This untreated sewage, from 10,560 persons, enters the river 7 to 15 miles above the recreational waters of the Lake Harding impoundment.

Walter F. George Reservoir Area

Raw and treated sewage from Columbus, Georgia, Phenix City and Eufaula, Alabama, and Fort Benning enter the river in the vicinity of the Walter F. George Reservoir. Treatment removes only 32 per cent of the coliform bacteria in this sewage from approximately one quarter of a million persons (239,400), and a residual of 162,000 population equivalents of sewage bacteria is discharged to the waters of this recreational area.

The 150,000 BPE bacterial load from Columbus, second largest source in the survey area, has been discussed previously.

Phenix City, with a population of 28,700, operates a new secondary treatment plant equipped for effluent chlorination. During the survey, however, the chlorination facilities were not effective, the coliform content of the final effluent amounted to 2,200,000 per 100 ml, and 1,770 bacterial

population equivalents were discharged to the river in the final effluent. This plant produced excellent reductions of other pollutional constituents and could reduce the bacterial load to suitable levels if the chlorination facilities were operated effectively.

All of Fort Benning's sewage is treated in three plants. Two are primary plants with chlorination, and the third is an activated sludge type secondary treatment plant followed by detention in a natural pond. Bacteriological treatment was excellent. The effluent from the two plants employing chlorination contained 300 and 1,500 coliform organisms per 100 ml respectively and that from the activated sludge plant contained 4,900. Treatment removed 99.99 per cent of the sewage bacteria, and only five bacterial population equivalents entered the river from Fort Benning.

Sewage from Eufaula (population 10,000) was discharged to the Walter F. George Reservoir without treatment.

OXYGEN DEMAND LOADS (SEWAGE AND INDUSTRIAL WASTE)

One million population equivalents of oxygen-demanding material were discharged to the surveyed area of the Chattahoochee River watershed. Less than one-third of the original one and one-half million population equivalents was removed by treatment.

Raw and treated municipal sewage made up 78 per cent (814,219 PE), and separate untreated industrial waste discharges amounted to 22 per cent (225,240 PE) of the net load entering the rivers.

The proportionate loads discharged by municipalities and industries are illustrated on Figure 3. Details are tabulated in Tables 4 and 5.

Atlanta, Georgia

More than one-half million population equivalents (564,360 PE) of oxygen-demanding material was discharged from the Atlanta sewage plants. Thirty-four per cent of the raw sewage load was removed by primary treatment, but the residual discharge amounted to more than half (54 per cent) of the total BOD load from the entire study area.

Sonoco Products Company of Atlanta, manufacturing paper products, discharged 20,000 PE and the Atlanta Municipal Incinerator discharged 5,200 PE of untreated wastes through separate sewers.

Columbus, Georgia

Untreated and treated sewage from Columbus, Georgia, approximating 176,000 population equivalents, or 17 per cent of the total, comprised the second largest oxygen-demanding load in the surveyed area. Six MGD of city sewage received primary treatment at the new 25 MGD

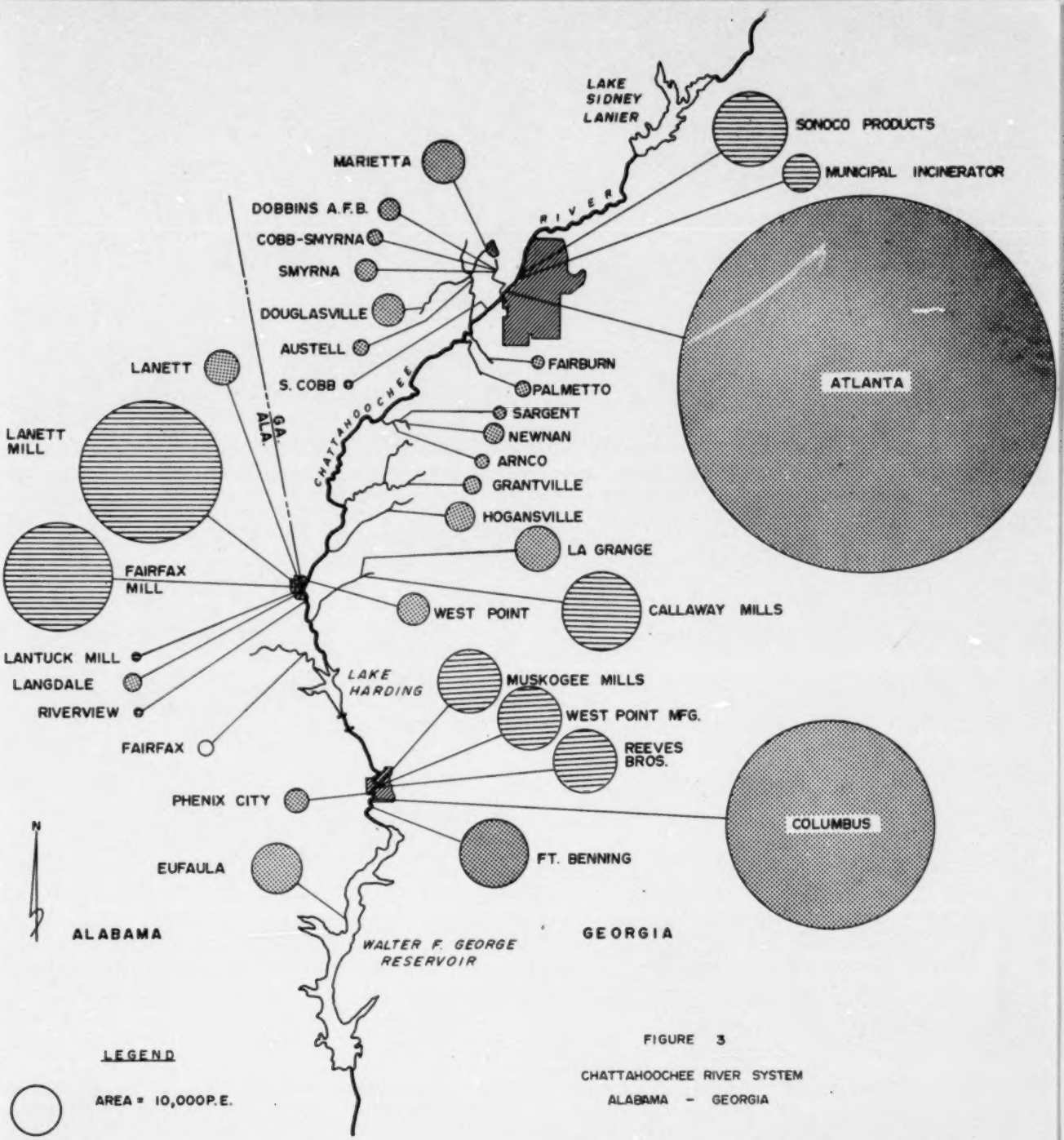

FIGURE 3

CHATTAHOOCHEE RIVER SYSTEM
ALABAMA - GEORGIA

LEGEND

AREA = 10,000 P.E.

MUNICIPAL WASTE DISCHARGE

INDUSTRIAL WASTE DISCHARGE

MUNICIPAL AND INDUSTRIAL WASTES
OXYGEN DEMANDING POPULATION EQUIVALENTS DISCHARGED

capacity treatment plant which will treat approximately 20 MGD when the interceptor construction project is completed.

Cobb and Douglas Counties

Approximately 17,000 PE, representing 1.6 per cent of the total area-wide load, was discharged by the communities in Cobb and Douglas counties. About 84 per cent of the 104,750 PE raw sewage BOD was removed by the treatment plants, most of which were secondary units providing high BOD removal efficiencies.

Between Atlanta and West Point

Approximately 17,000 PE were discharged to the watercourse in this area. As detailed in Table 4, three of the communities operate secondary plants, five operate less effective primary plants, and two discharge part of their sewage without treatment. Sixty-one per cent of the original 42,430 PE raw sewage was removed by treatment.

Callaway Mills of La Grange, textile manufacturers, discharged approximately 24,000 PE of untreated wastes to the stream.

West Point and Lanett Area

Sewage and industrial wastes from this area, except the 0.1 MGD flowing through the ineffective Fairfax Imhoff tank, enters the rivers without treatment. The 138,600 PE total included raw sewage from the 10,560 persons residing in this area.

The untreated industrial waste portion of the load, discharged by the textile mills in Lanett, amounted to 128,040 population equivalents of BOD. Of these 79,000 PE was discharged by the Lanett Mill Bleaching and Dye Works, 48,750 PE by the Fairfax Mill, and 290 by the Lantuck Mill.

Walter F. George Reservoir Area

One-quarter million population equivalents of oxygen-demanding wastes are discharged into the headwaters of Walter F. George Reservoir. Eighty per cent of this load is from treated and untreated sewage and 20 per cent is from separate untreated industrial waste sources.

The 176,000 PE load from Columbus, second largest source in the entire Chattahoochee River survey area, has been discussed previously.

Excellent BOD reductions were accomplished by the new Phenix City secondary sewage treatment plant. Ninety-two per cent of the original 28,700 PE was removed and the residual 2,300 PE entered the river.

Fort Benning's three treatment plants removed 65 per cent of the original BOD and 17,520 PE reached the river.

Three textile mills in Columbus, Georgia, (Muskogee Mill, West Point Manufacturing Company, and Reeves Bros.) discharged approximately 48,000 PE of untreated industrial wastes to the river through separate sewers. It is estimated that approximately 16,000 PE was discharged from each of these three mills.

EFFECTS OF POLLUTION ON WATER QUALITY AND USE

BACTERIAL POLLUTION

More than 100 miles of the Chattahoochee River from Atlanta to upper Lake Harding, 40 miles from Columbus to Florence Landing in the Walter F. George Reservoir, and localized areas of the Walter F. George Reservoir near Eufaula, were polluted with sewage-associated bacteria.

Water polluted by sewage frequently contains pathogenic bacteria which, if ingested, can cause gastrointestinal diseases, such as typhoid fever, dysentery, and diarrhea. Body contact with sewage-polluted water can cause eye, ear, nose, throat, or skin infections. The infectious hepatitis virus, and other viruses, may also be present. Excessive bacterial pollution of a river, or reservoir, presents a health hazard to all who come in contact with the water.

Sewage also contains readily detectable coliform bacteria, which typically occur in excreta or feces. Though generally harmless in themselves, coliform bacteria are always present in sewage-polluted water and have therefore been considered indicators of the probable presence of pathogenic bacteria. Many state and interstate water pollution control agencies evaluate water quality on the basis of sanitary survey findings

and total coliform content. Decisions based on total coliform data alone, however, have sometimes been challenged because bacteria from sources other than excreta are included in the total coliform group.

Within recent years a more selective test has been developed to identify fecal coliform bacteria, which specifically inhabit the intestinal tract of man and warm-blooded animals. The presence of these organisms in water is positive proof of fecal contamination which may contain asscoiated, disease-producing organisms such as, Salmonella.

More recently, refined methods for isolation and detection of Salmonella organisms have made it practical to test for these specific infectious disease bacteria.

Bacterial analyses were limited to total coliform determinations during the October-November 1964 survey from Atlanta to Lake Harding. The June-July 1965 survey in the vicinity of Columbus and Walter F. George Reservoir included total coliform, fecal coliform, and Salmonella determinations.

Coliform Bacteria

Neither the State of Alabama nor the State of Georgia have standards for coliform bacterial density. Where water quality criteria have been established, a commonly accepted upper limit for river water used as a source of treated domestic water supply and for boating, fishing and general recreation is 5,000 coliform bacteria per 100 ml. A commonly accepted upper limit for swimming, skiing and other water contact sports is 1,000 per 100 ml.

Coliform densities measured in the Chattahoochee River and impoundments are illustrated on Figure 4 and detailed in Tables 6, 7, and 8.

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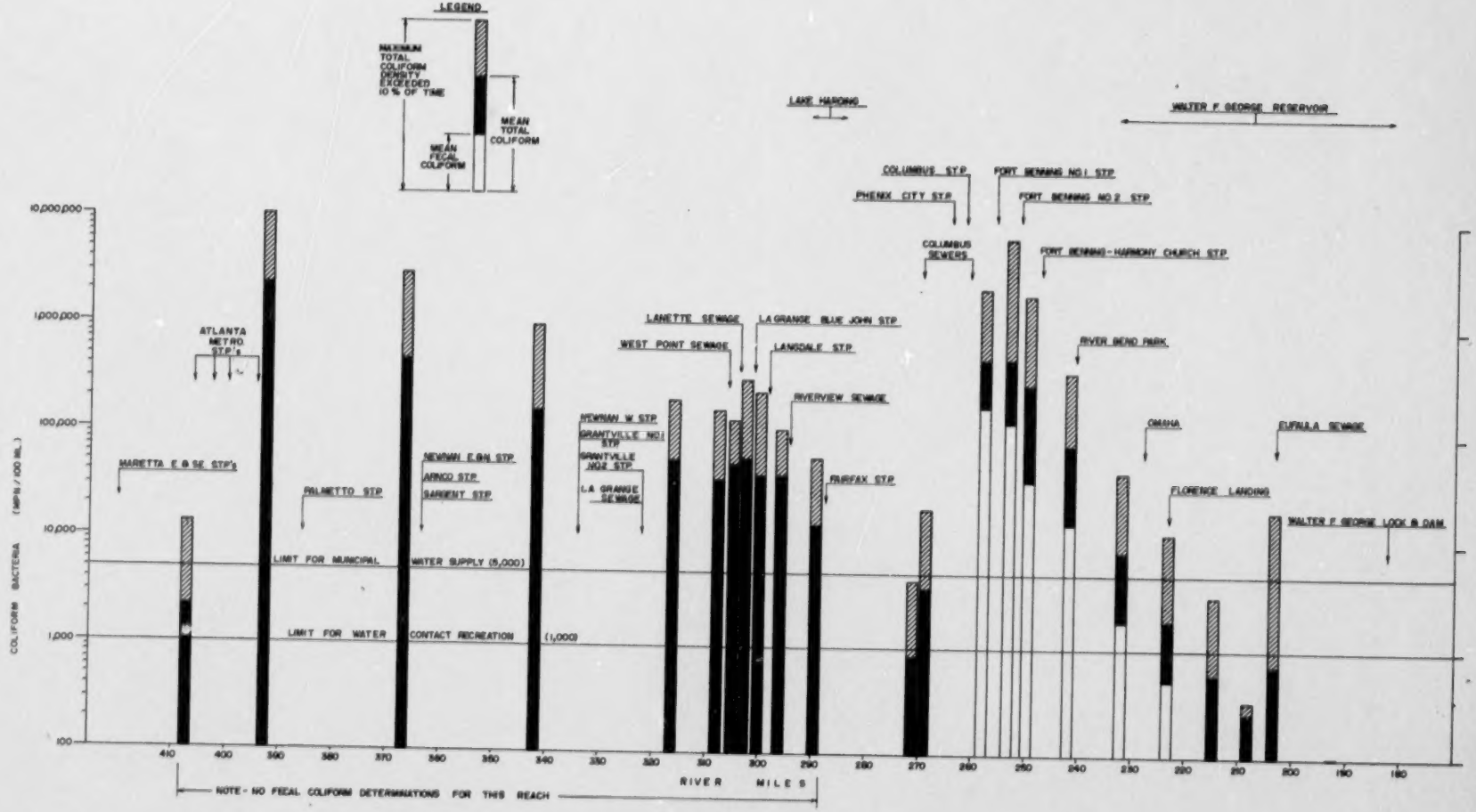


FIGURE 4

COLIFORM BACTERIA

CHATTAHOOCHEE RIVER SYSTEM
ALABAMA — GEORGIA

The mean densities were determined from probability plots of observed data. The coliform density that was equalled or exceeded 10 per cent of the time, rather than the single highest observed value, is referred to as the maximum density.

Although coliform densities equalled or exceeded 13,000 per 100 ml 10 per cent of the time, the 2,200 mean density in the Chattahoochee River at the Atlanta Water Works intake met the 5,000 MPN/100 ml water supply criteria.

Nineteen miles downstream from the Atlanta Metropolitan Area sewers, at the Highway 92 bridge, the mean coliform density was increased 1,000-fold to 2,400,000 and equalled or exceeded 10,000,000 MPN/100 ml 10 per cent of the time.

Coliform densities were reduced by natural purification and normal bacterial die-off as the river flowed 85 miles to West Point. The numbers of residual coliforms destroyed greatly exceeded the 15,000 population equivalents of additional coliform bacteria discharged to the tributaries along this reach.

Despite this reduction, the river still contained 37,000 coliforms per 100 ml, or seven times the water supply criteria, at Sampling Station 306.7, located less than one mile upstream from the West Point Municipal Water Works intake. Densities equalled or exceeded 160,000 MPN/100 ml 10 per cent of the time. A substantial portion of this residual bacterial load originated in Atlanta.

West Point sewage entered the river without treatment about one mile above the Lanett Municipal Water Works intake, and increased the

coliform densities to 50,000 MPN/100 ml, or 10 times the water supply criteria, at the Georgia-Alabama state line station located below the sewers and only 0.2 miles above the water intake. Densities equalled or exceeded 130,000, 10 per cent of the time.

Lanett sewage increased the mean coliform content to 57,000 at the airport station located about 2.5 miles below the state line.

Within the next 13 miles, coliform die-off again exceeded the bacterial input from sewers within this reach. Though substantially reduced by natural purification, the residual 14,000 coliform density in upper Lake Harding was still 14 times the criteria for water contact recreational use. Coliform densities were further reduced during passage through Lake Harding and a later August-September 1965 survey showed 35 MPN/100 ml at the Bartletts Ferry Dam outlet.

At the Columbus Municipal Water Supply intake above Oliver Dam the 800 MPN/100 ml total coliform density, which included two per cent fecal coliforms, met the water supply criteria.

Untreated sewage from approximately 1,200 persons in north Columbus entered the river below Oliver Dam and the mean total coliform density increased to 3,600 MPN/100 ml at the Phenix City Water Supply intake less than one mile downstream and across the river. Though the mean total coliform density, containing one per cent fecal coliforms, met the 5,000 MPN/100 ml water supply criteria, the maximum coliform densities, including eight per cent fecal coliforms, equalled or exceeded 20,000, 10 per cent of the time.

Raw and treated sewage from Columbus and treated sewage from Phenix City, all unchlorinated at the time, entered the next five-mile reach of the river adjoining these two cities.

The mean total coliform density vastly exceeded all water use quality criteria as it increased sharply to 490,000 MPN/100 ml, in the impounded river channel three miles below the Columbus sewage treatment plant outfall. Thirty-seven per cent of these were fecal coliforms.

Though total coliform densities were successively reduced at each downstream station in the next 50 miles of Walter F. George Reservoir, water along 35 of these miles, from Columbus to Florence Landing, exceeded the 1,000 MPN/100 ml criteria for water contact recreation. The relatively low coliform content in Fort Benning's treated sewage and the slope of the coliform form die-off curve show that Columbus and Phenix City sewages are primarily responsible for bacterial pollution of this reach.

After reaching a low of 250 MPN/100 ml, the mean total coliform density increased to 740 and the maximum exceeded 20,000, 10 per cent of the time at Eufaula. Fecal coliform bacteria also increased about threefold at this location. Bacterial pollution of this localized area of the reservoir is attributed to untreated sewage from Eufaula.

Bacterial water quality in the lower 20 miles of reservoir, from below Eufaula to the Walter F. George Lock and Dam, was excellent. A mean total coliform content of 8 MPN/100 ml was observed halfway down the reach.

Salmonella Bacteria

In addition to routine coliform analyses, special Salmonella bacteria detection studies were conducted at certain locations in the

Columbus-Walter F. George Reservoir area during the June-July 1965 survey.

While coliform densities indicate the magnitude of fecal pollution which may contain disease-producing organisms, detection of pathogenic Salmonella bacteria in river water is positive proof that these infectious disease-producing organisms are actually present.

Salmonellosis, the disease caused by various species of Salmonella bacteria, includes typhoid fever, gastroenteritis and diarrhea. There are more than 900 known serological species of Salmonella. Table 9 lists the seven species which infected man most frequently in the United States during June 1965. Six of these seven, namely, S. typhi-murium, S. typhi-murium var. copenhagen, S. heidelberg, S. infantis, S. newport, and S. saint-paul, were isolated from the Chattahoochee River during the June-July 1965 survey.

All five modified Moore swab samples retrieved from the Chattahoochee River, and two of the four samples retrieved from sewage treatment plant outfalls, contained Salmonella bacteria. Results are shown in Table 10.

Salmonella montevideo and S. muenchen were found in the river at the Columbus Water Supply intake and Salmonella heidelberg was found at the Phenix City Water Supply intake. The presence of pathogenic organisms in these waters, which on the average met the coliform criteria for water supplies, emphasizes the need for adequate pollution abatement, and reaffirms the absolute necessity for continuous thoroughly effective water treatment which can remove Salmonella and other pathogenic bacteria.

Salmonella bacteria were found in Chattahoochee River water samples collected above Upatoi Creek, at River Bend Park and at Florence Landing. This confirmation of the coliform findings showed that pathogenic bacteria

from fecal pollution persisted for more than 35 miles downstream from Columbus.

At Fort Benning's first and second sewage treatment plants, the final effluents were disinfected with chlorine. Salmonella organisms were not recovered from the swab samples from these two effluents which contained mean coliform densities of 300 and 1,500 MPN/100 ml respectively. Neither primary treatment at Columbus, nor secondary treatment at Phenix City removed the pathogens from sewage. The Columbus treatment plant effluent contained S. typhi-murium var. copenhagen and S. derby, and the Phenix City Treatment Plant effluent contained S. newport.

Danger to Health

Sewage from 883,000 persons entered the Chattahoochee River. Most of this sewage received primary, but not secondary, treatment. Less than 10 per cent was disinfected and less than half of the coliform bacteria were removed by treatment.

Mean coliform densities in river water pumped to the La Grange, West Point, and Lanett municipal water treatment plants exceeded the 5,000 MPN/100 ml criteria for water supply sources. Though mean coliform density criteria were met, river water supplies for the Columbus and Phenix City water treatment plants contained pathogenic Salmonella bacteria.

Coliform densities greatly exceeded the bacterial water quality criteria for swimming, skiing, fishing, boating, and general recreational use along the entire 100-mile reach from Atlanta to upper Lake Harding. These criteria were also exceeded, and pathogenic Salmonella bacteria

were found, in more than 35 miles of the river from Columbus into upper Walter F. George Reservoir.

Bacterial pollution endangered the health of persons contacting Chattahoochee River water along more than 135 miles of local and interstate waters in Georgia and Alabama.

DISSOLVED OXYGEN

The Georgia Water Quality Control Board Rule No. 3, Standards of Water Purity, specifies that . . . "The dissolved oxygen content of the waters shall not be depleted to an extent that will interfere unduly with the reasonable and necessary uses of water . . . . " Though statewide dissolved oxygen standards have not been established, the Alabama Water Improvement Commission has, in individual cases, specified a minimum dissolved concentration of 4.0 mg/l for protection of fish and aquatic life. To meet water quality objectives for fish and aquatic life, the dissolved oxygen content of the Chattahoochee River should be maintained at least above 4.0 mg/l at all times.

Atmospheric oxygen is supplied to waters by natural reaeration at rates which are greatest in swiftly flowing turbulent streams, moderate in slowly moving deep rivers, and minimal in still water. Oxygen is removed from water by the biochemical demand of constituents in sewage and industrial wastes. Though the pollutional strength of such constituents is conventionally measured by the amount of oxygen they remove in 5 days, they continue to use oxygen over a much longer period of time, sometimes a month or more, before their demands are fully satisfied.

The dissolved oxygen content of a flowing stream receiving wastes from a single source, for example, will be progressively reduced at successive downstream locations as long as the oxygen demand of the wastes exceeds the reaeration capacity of the flowing stream. DO concentrations may continue to fall throughout one or more days flow time into the critical reach where minimum DO's occur and where the oxygen supply and demand reaches equilibrium.

Downstream from this critical reach, the amount of oxygen supplied to the river by reaeration will exceed the reduced residual oxygen demand of the partially stabilized wastes and the stream will start to recover.

Additional phenomena occur in reservoirs where velocities approach zero, turbulent mixing subsides, depths increase, stratification occurs, and waters are impounded for months, or even seasons, before being released once again as free flowing streams. Residual unoxidized materials, that are carried along in the flowing river, are retained and exert their total long-term oxygen demand during residence in the reservoir. Though surface waters are oxygenated, stratification minimizes vertical mixing and little, if any, additional atmospheric oxygen penetrates the depths to replace that being used by decomposition of residual unstable waste materials, and natural plant and animal cells. As a result, the deeper waters may contain little or no dissolved oxygen. Where such oxygen deficient waters are released through hydroelectric generators, drawing water from the depths behind the dam, the lower river may also be devoid of oxygen and may not recover for many miles downstream.

The dissolved oxygen content of the Chattahoochee River from Franklin to Lake Harding, during October-November, 1964, is shown in Table 11.

The 1964 survey, which did not include DO studies along the first 65-mile reach below Atlanta, revealed satisfactory dissolved oxygen concentration in the river from Franklin, Georgia, to Lake Harding and in the surface waters of Lake Harding.

During a previous August 1963 survey, which included the Atlanta area, the Georgia Department of Public Health observed a series of DO's

consistently below 4.0, with a minimum of 2.1 mg/l, in the reach extending 20 to 40 miles below Atlanta (from Georgia Highway 92 to Whitesburg). Degradation of this reach in Georgia was caused by sewage and industrial wastes from the Atlanta Metropolitan Area.

Eleven samples collected near the bottom of Lake Harding at Bartletts Ferry Dam during a later August-September 1965 survey contained no dissolved oxygen.

The dissolved oxygen content of the Chattahoochee River was satisfactory in the flowing reaches downstream from Columbus and in the surface waters of the Walter F. George Reservoir, but was reduced below 4.0 mg/l in the deep reservoir waters and in the river below the dam at Fort Gaines.

As shown in Figure 5, six to seven mg/l of DO were present in the flowing channelized reach of the Walter F. George impoundment from the Fort Benning Bridge to River Bend Park. As the channel deepened, velocities decreased, and thermal stratification (shown in Figure 6) became evident in the next 20 miles to Florence Landing, where DO's ranged from 8.0 at the surface to 4.7 at a 40-foot bottom depth. Stratification became more pronounced and the dissolved oxygen content of the deeper waters was reduced below 4.0 mg/l in the next 20-mile reach to Eufaula. From Eufaula to the dam, the DO ranged from about 8.0 mg/l at the surface to 4.0 mg/l at 15 to 20-foot depths, but was progressively reduced below 4.0 mg/l to less than 1.0 mg/l in the deeper reservoir waters.

Oxygen deficient water, drawn from the depths of the reservoir and released through the power generators at the Walter F. George dam, returns

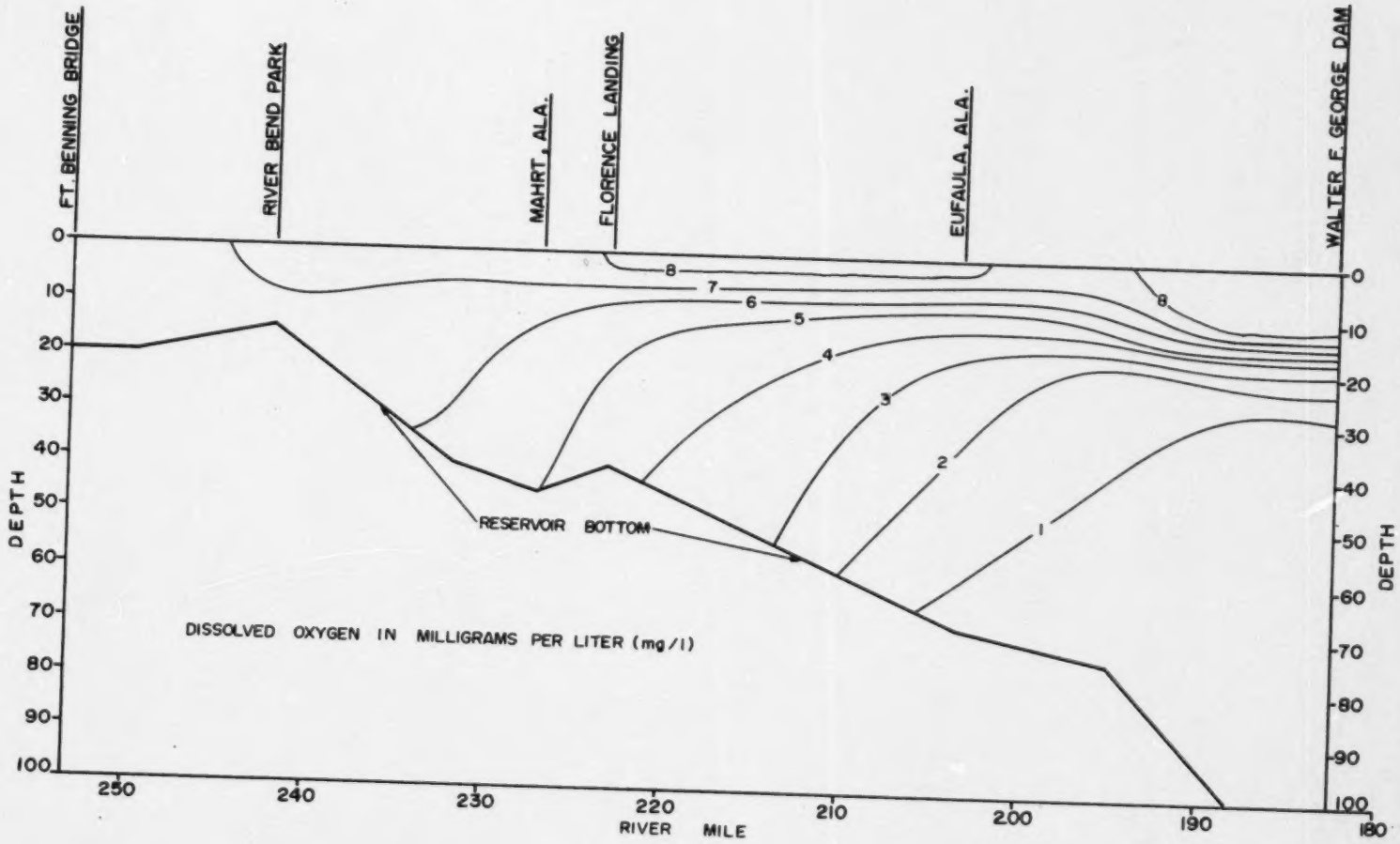


FIGURE 5

CHATTAHOOCHEE RIVER SYSTEM

ALABAMA – GEORGIA

DISSOLVED OXYGEN PROFILE

WALTER F. GEORGE RESERVOIR

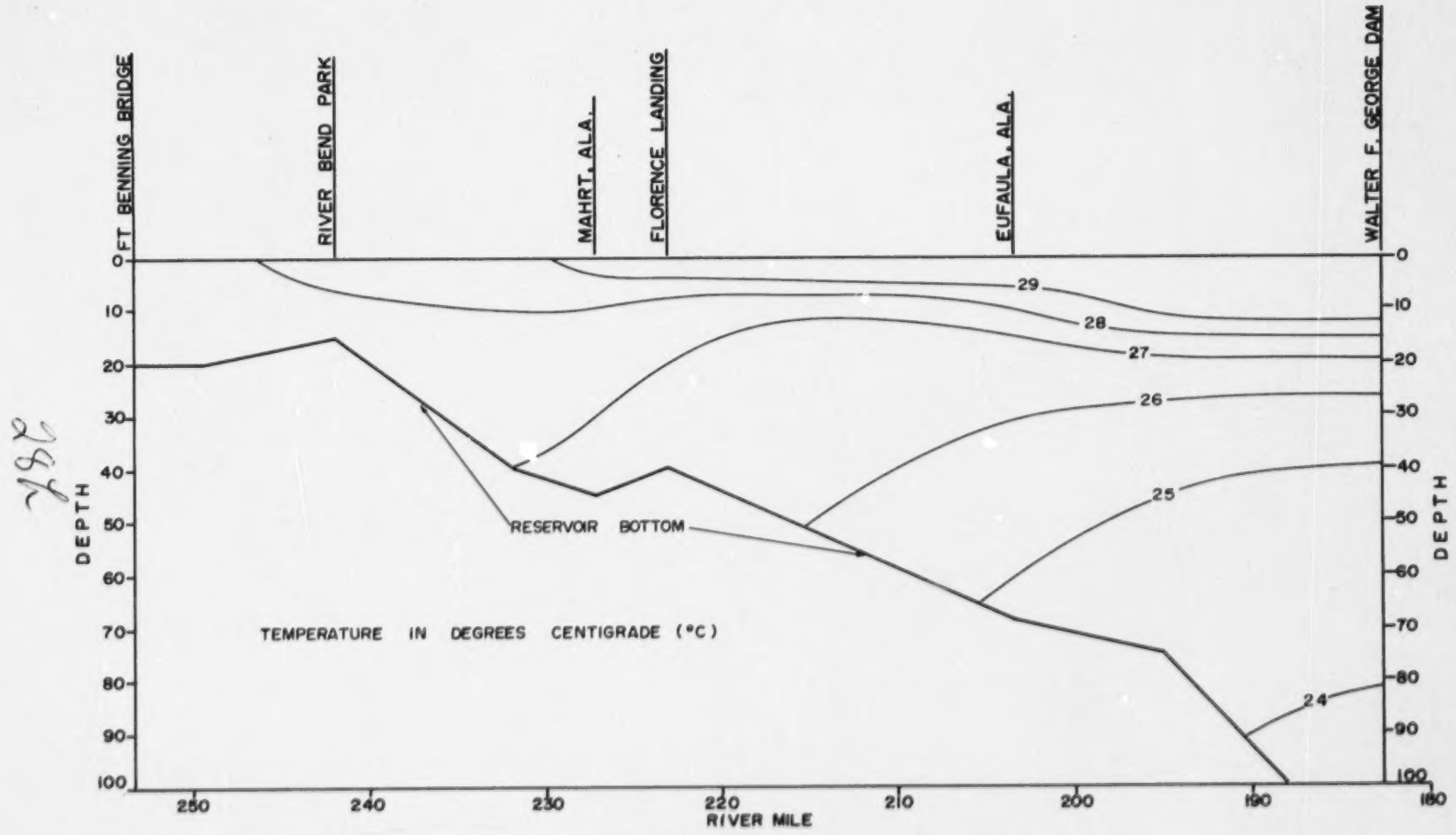


FIGURE 6

CHATTAHOOCHEE RIVER SYSTEM

ALABAMA – GEORGIA

TEMPERATURE PROFILE

WALTER F. GEORGE RESERVOIR

to the Chattahoochee River channel as a free flowing river above Fort Gaines, Georgia. During a May-June 1965 survey, the dissolved oxygen content of the river water averaged 3.8 mg/l, was less than 3.0 in six of the 14 samples, and sagged to a minimum of 0.8 mg/l at the Fort Gaines bridge, two miles below the dam.

TIME OF PASSAGE STUDIES

Results of the two studies conducted to determine time of passage in the Chattahoochee River from Columbus-Phenix City to River Bend Park are shown on Figure 7. In each case, dye was released in the urban Columbus-Phenix City area and traced to River Bend Park, some 20 miles downstream.

The first batch of dye was released into the river when the Oliver Dam Hydro Plant was discharging 8,520 cfs through the turbines. This discharge was maintained for 12.5 hours after the dye release except for a 25-minute period during which the flow was increased to 12,160 cfs. At the end of this 12.5 hour period, the discharge was reduced to 1,240 cfs. Under these conditions the river velocity decreased steadily from 50 miles/day near the Phenix City and Columbus sewage treatment plants, to 3 miles/day at the upstream end of River Bend Park. Approximately 1.2 days were required for passage through the 20-mile reach from the Columbus Sewage Treatment Plant (R.M. 261.9) to River Bend Park (R.M. 241.8).

A second batch of dye was released at a time when the Oliver Dam Hydro Plant was discharging a minimum flow of 1,240 cfs. This flow

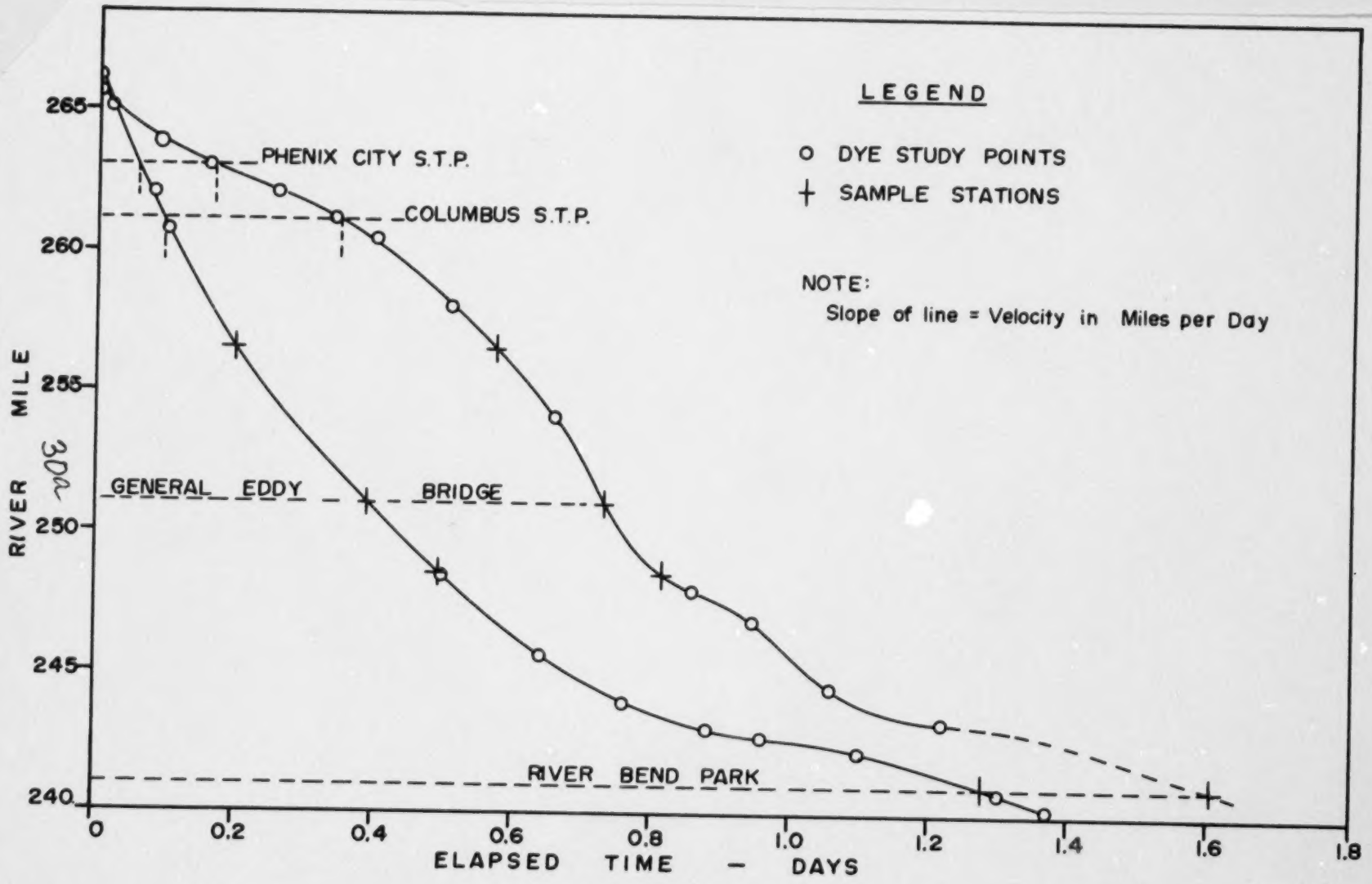


FIGURE 7

CHATTAHOOCHEE RIVER SYSTEM

ALABAMA - GEORGIA

TIME OF PASSAGE

was maintained for approximately six hours after the dye release. Flows then increased in steps over a three-hour period, to a maximum of 8,520 cfs. This maximum flow was maintained for approximately nine hours, and then reduced in steps over a period of three hours to the minimum of 1,240 cfs.

During this second study, the initial river velocity at the Phenix City and Columbus sewage treatment plants was about 10 miles/day. As flows increased velocity also increased to about 40 miles/day at the General Eddy Bridge (R.M. 253.3), and then decreased to about three miles per day at River Bend Park (R.M. 241.8). Approximately the same total time (1.2 days) was required for passage from the Columbus Sewage Treatment Plant to River Bend Park for each of the two flow conditions, however, the velocity patterns between these two points were almost exactly reversed.

GENERAL RECOMMENDATIONS

The following general pollution abatement procedures are recommended to protect and preserve the Chattahoochee River for present and future beneficial use:

1. Cities and industries should pursue existing pollution abatement programs diligently and treat all sewage and industrial wastes effectively, according to the requirements of the Georgia Water Quality and Control Board and the Alabama Water Improvement Commission. Compliance with the full intent of existing state water quality control policies will, in effect, accomplish the objectives of the following supplemental recommendations:

2. All domestic sewage should receive adequate secondary treatment with effective effluent disinfection, treatment works should be operated at maximum purification efficiencies, and total and fecal coliform bacteria analyses should be included among other essential control tests.

3. All pollutional materials in industrial wastes should be controlled to achieve removals equivalent to those which can be attained in secondary type sewage treatment plants. Domestic sewage originating in industrial plants should be discharged to municipal sanitary sewers or receive secondary treatment and disinfection at the plant.

4. Pollution by sewage included in combined storm and sanitary sewers should be abated. No new combined sewers should be constructed and sanitary sewage should be separated from existing combined sewers as soon as practicable.

SUMMARY AND CONCLUSIONS

The Chattahoochee River, which sustains social, economic, and industrial growth and development in Georgia and Alabama, is used extensively for domestic and industrial water supply, production of hydroelectric power, and water-oriented sports recreation.

Treated and untreated sewage from 26 cities, untreated wastes from nine separate industries, and heat from three steam-electric generating plants were discharged into the river within the 225-mile reach between Atlanta and Fort Gaines.

Atlanta, Georgia, the largest source of sewage, discharged more than half of the total bacterial and oxygen-demanding loads to the river. Untreated sewage bypassed the Clayton Treatment Plant about one-third of the time. After primary treatment, the effluent reaching the river contained 564,000 population equivalents of oxygen-demanding material and 282,000 population equivalents of sewage-associated bacteria.

Columbus, Georgia, the second largest source of sewage, discharged 176,000 population equivalents of oxygen-demanding material (17 per cent of the total), and 150,000 population equivalents of sewage-associated bacteria (31 per cent of the total).

The Remaining 26 Georgia and Alabama communities, described in the report, discharged 74,000 population equivalents of oxygen-demanding material (7 per cent of the total) and 44,000 population equivalents of sewage-associated bacteria (10 per cent of the total) to the watershed.

Untreated industrial wastes reaching the river contributed 225,000 population equivalents, or 22 per cent of the total oxygen demand load. The largest single industrial waste load, amounting to 79,000 P.E., was discharged by the Lanett Mill and Bleachery in Lanett, Alabama, and the second largest single load, amounting to 48,700 P.E., was discharged by the Fairfax Mill of Lanett. A total of 98,000 additional population equivalents of oxygen-demanding wastes were discharged by the other seven industries listed in the report.

Pollution from sewage increased the total coliform bacterial density of river waters far above upper critical limits of 1,000 MPN/100 ml for water contact sports, such as swimming and skiing, and 5,000 MPN/100 ml for treated water supply sources, fishing, boating, and general recreation.

The following mean coliform densities were observed during the surveys:

MPN/100 ml	
2,000	Atlanta Water Supply Intakes
2,400,000	20 Miles Below Atlanta
37,000	West Point Water Supply Intake
50,000	Lanett Water Supply Intake
14,000	Upper Lake Harding
800	Columbus Water Supply Intake
3,600	Phenix City Water Supply
490,000	W. F. George Reservoir (3 Miles below Columbus)
290,000	" " (12 ")
80,000	" " (20 ")
8,000	" " (30 ")
1,800	" " (40 ")
8	" " (70 ")

During special studies in the Columbus-W. F. George Reservoir area, pathogenic Salmonella bacteria were detected in the river at the Columbus and Phenix City Municipal Water Supply Intakes and in more than 35 miles of the Walter F. George Reservoir below Columbus.

Bacterial pollution endangered the health of persons contacting Chattahoochee River water along more than 135 miles of local and interstate waters in Georgia and Alabama.

The oxygen-demanding constituents in sewage and industrial wastes lowered the dissolved oxygen content of the river water below the

4.0 mg/l minimum requirement for propagation of fish and aquatic life in the reach extending from 20 to 40 miles below Atlanta in Georgia.

The long-term biochemical oxygen demand of sewage and industrial waste constituents, decomposition of natural plant and animal cells, and stabilization of bottom vegetation removed dissolved oxygen from deep waters in impoundments.

The dissolved oxygen concentration was reduced to zero at the bottom outlet of Lake Harding. It was reduced below 4.0 mg/l at depths of more than 20 feet in the main body of the Walter F. George Reservoir and approached zero in the deeper waters near the outlet. Dissolved oxygen concentrations averaged 3.8 mg/l and were reduced as low as 0.8 mg/l at the Fort Gaines bridge 2 miles below the outlet from the Walter F. George Lock and Dam.

Chattahoochee River water in the free flowing interstate reach at West Point, in the flowing chennelized reaches entering the reservoirs, and in the surface waters in the upper 15 to 20 feet of reservoir areas, contained adequate dissolved oxygen to support a well balanced, warm water, game fish population.

To protect and preserve the Chattahoochee River for present and future beneficial uses, pollution must be abated. Such action, in compliance with the rules and regulations of the Georgia and Alabama water pollution control agencies, should include secondary treatment and chlorination of all sewage, the equivalent of secondary treatment of all industrial wastes, effective operation and control of all treatment works, and separation of combined sewers.

Sewage and industrial wastes discharged to the Chattahoochee in Georgia cause pollution of the waters in Georgia and Alabama and sewage and industrial wastes discharged to the Chattahoochee River in Alabama cause pollution of the waters in Alabama and Georgia. This pollution endangers the health or welfare of persons in a state other than that in which the discharges originate, and therefore, is subject to abatement under the provisions of the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.).

APPENDIXES

FIGURE A

DETAIL MAP ATLANTA & VICINITY

CHATTAHOOCHEE RIVER SYSTEM

ALABAMA — GEORGIA

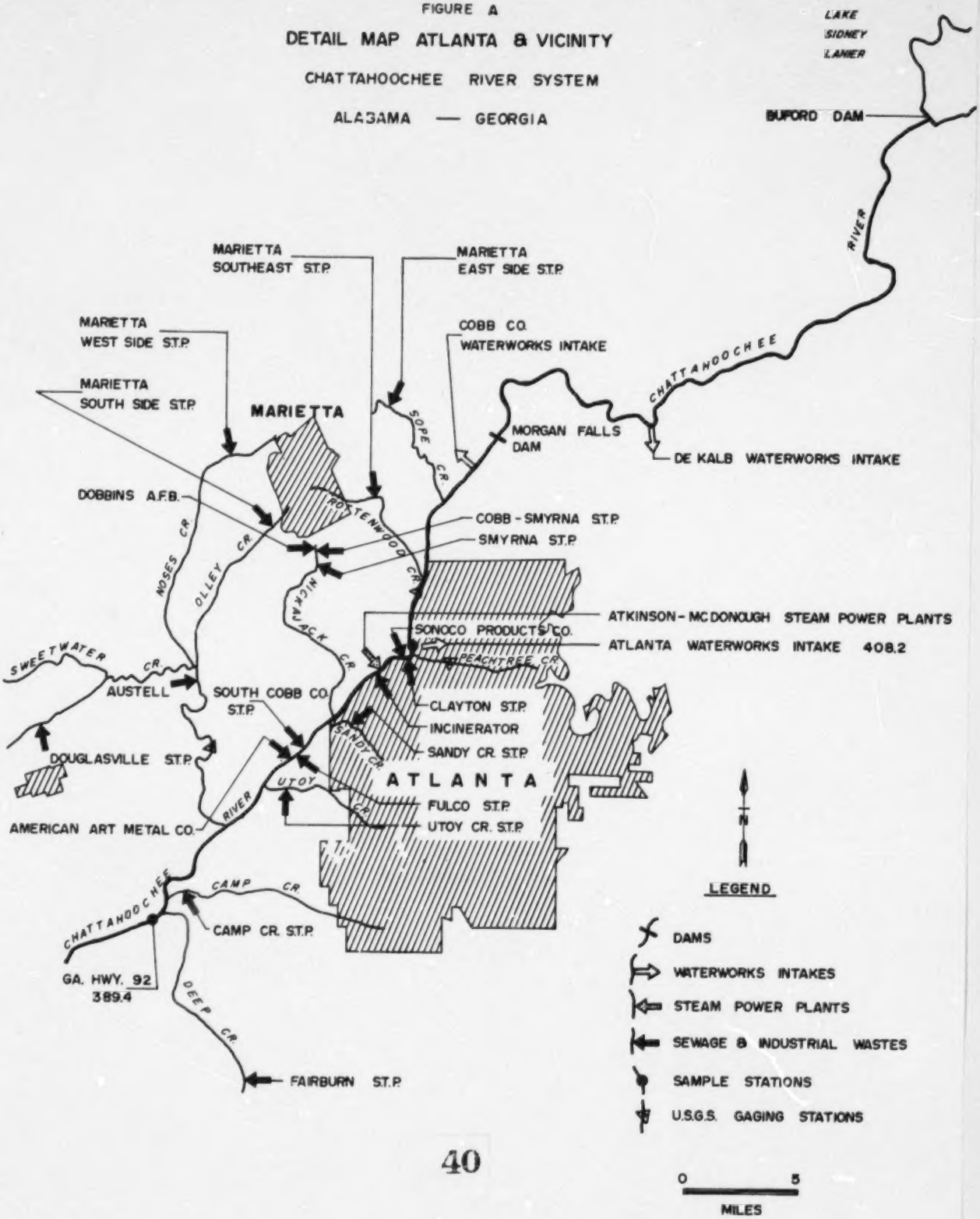


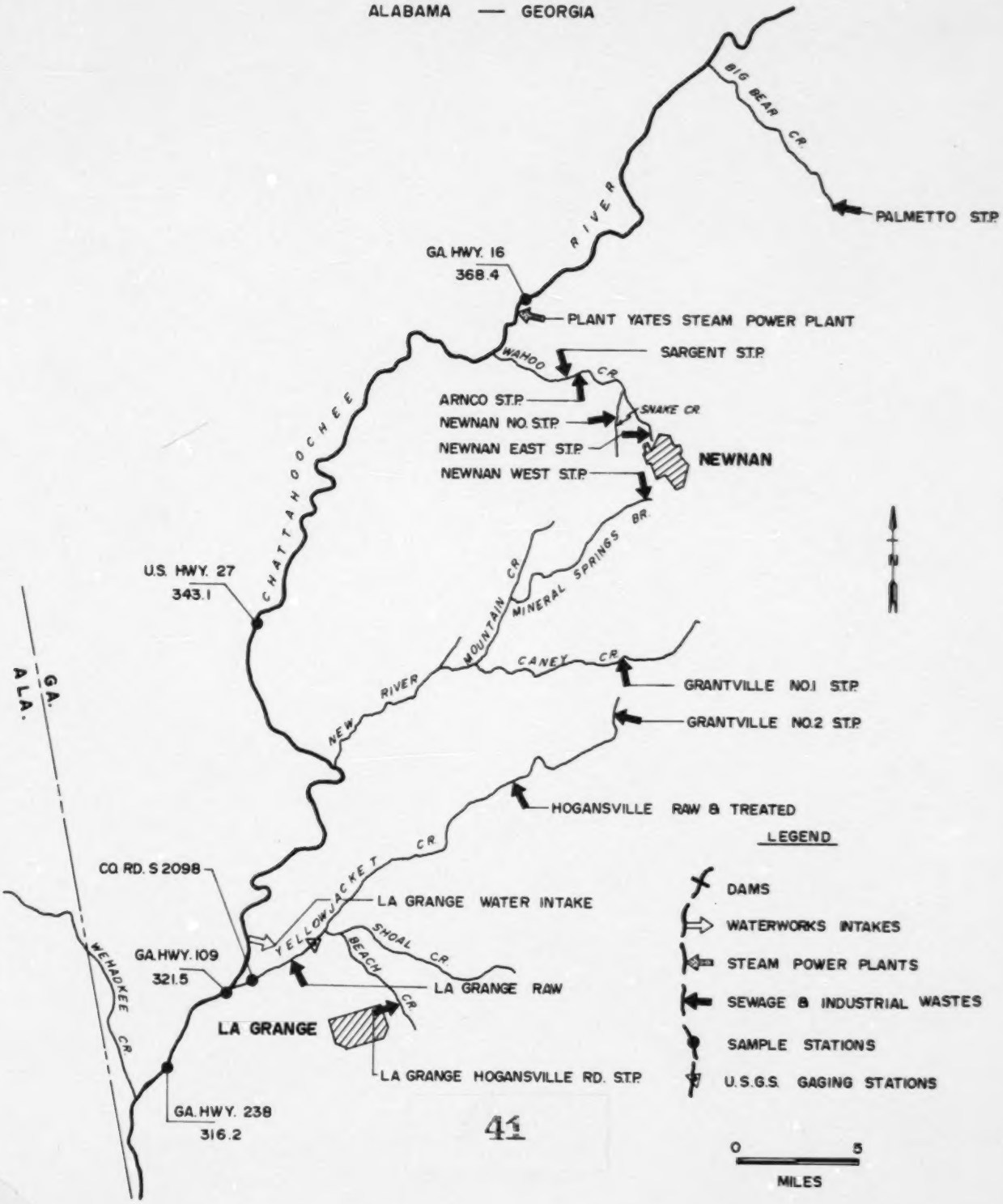
FIGURE B

DETAIL MAP

BELOW ATLANTA TO ABOVE WEST POINT

CHATTAHOOCHEE RIVER SYSTEM

ALABAMA — GEORGIA



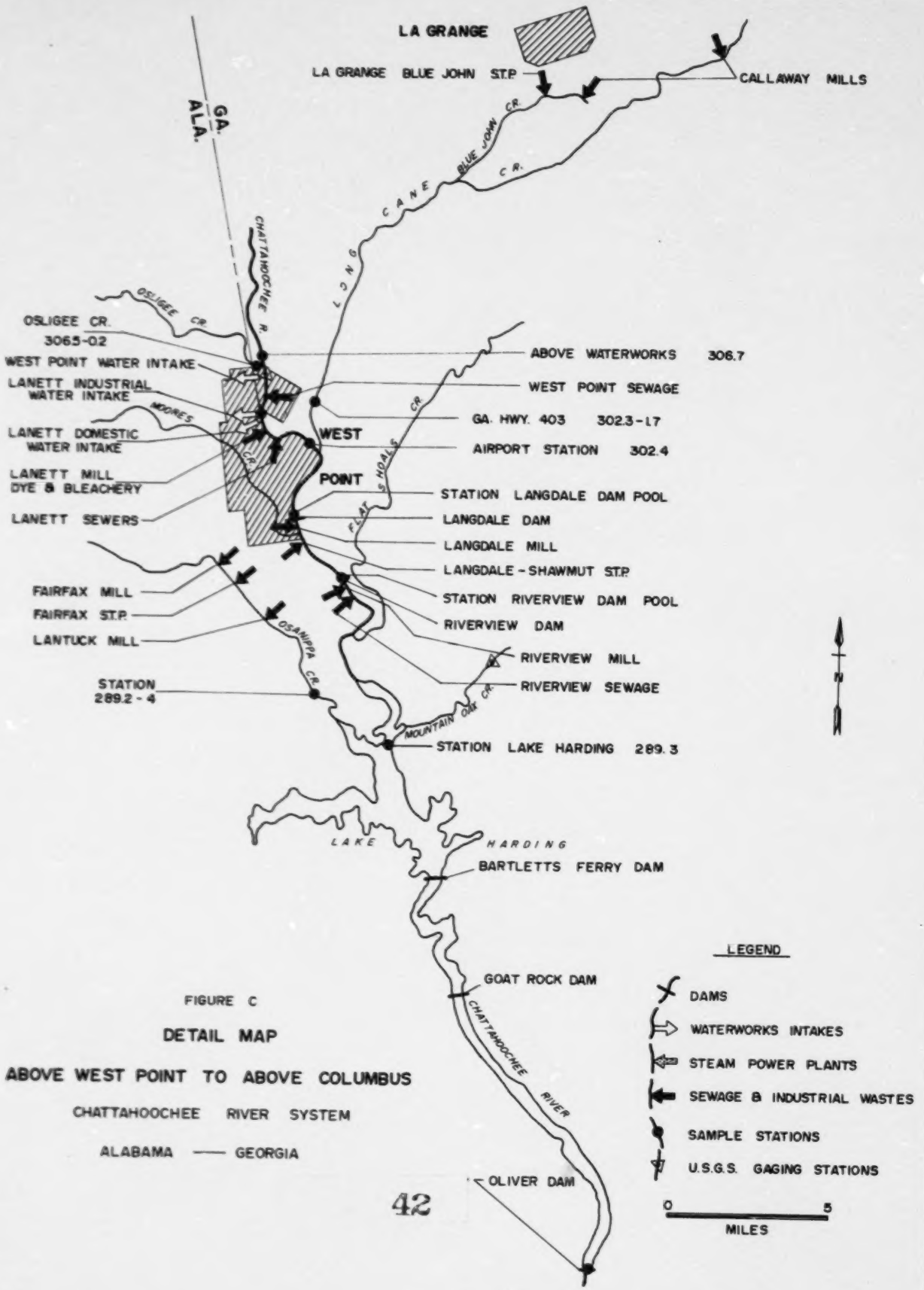


FIGURE C

DETAIL MAP

ABOVE WEST POINT TO ABOVE COLUMBUS

CHATTAHOOCHEE RIVER SYSTEM

ALABAMA — GEORGIA

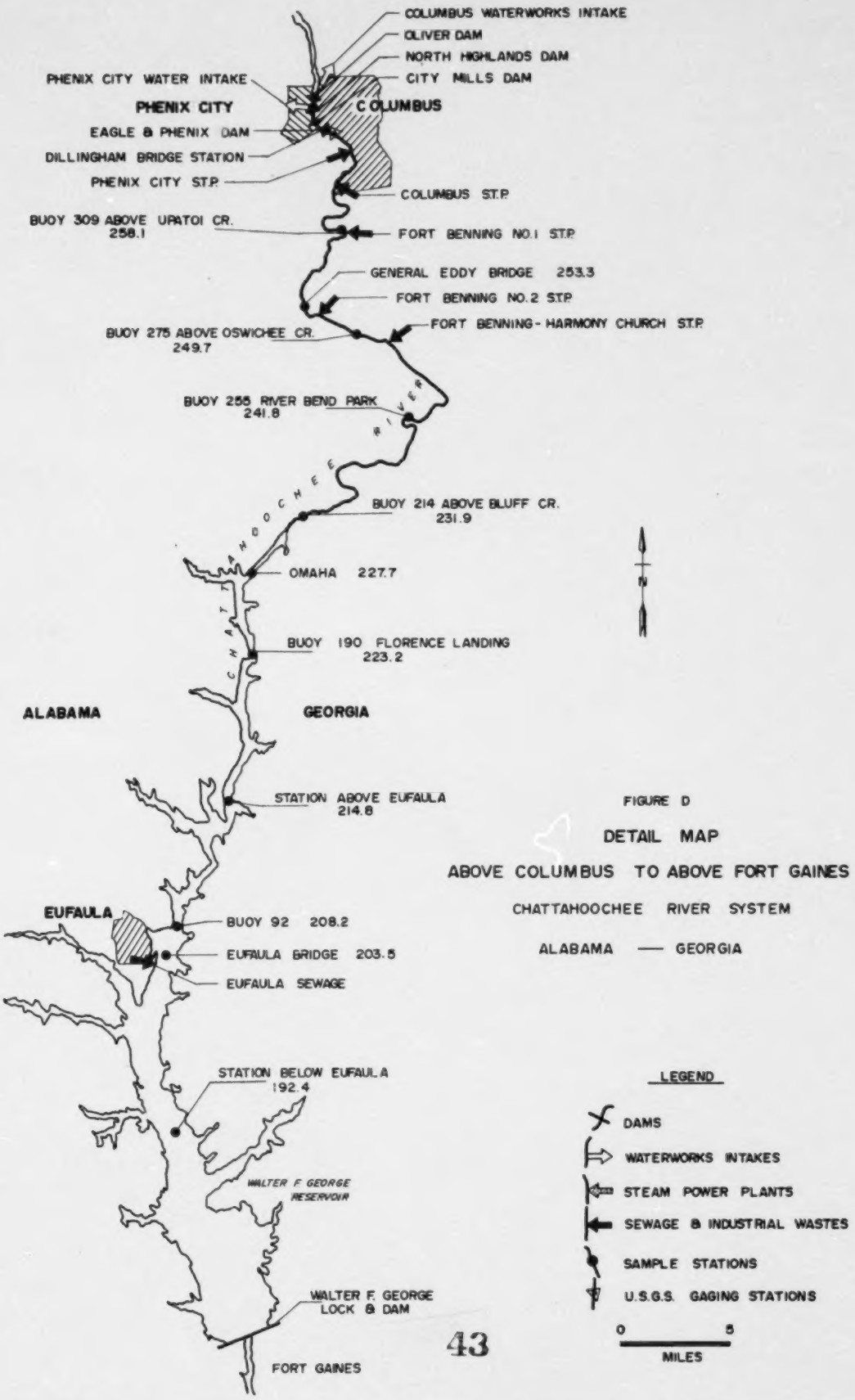


FIGURE D

DETAIL MAP

ABOVE COLUMBUS TO ABOVE FORT GAINES

CHATTAHOOCHEE RIVER SYSTEM

ALABAMA — GEORGIA

TABLE NO. 1

Reference Point Locations

Chattahoochee River

1964 & 1965 Surveys

Feature	River Mile
Sope Creek	416.1
Marietta East Side S. T. P.	416.1 - 6.3
Rottenwood Creek	412.1
Marietta Southeast S. T. P.	412.1 - 4.7
U.S.G.S. Gage No. 2-3360	410.6
Atlanta Water Works Intake (Sample Sta.)	408.2
Peachtree Creek	408.1
U.S.G.S. Gage No. 2-3363	408.1 - 4
Clayton S. T. P. (Atlanta)	408.0
Sonoco Products Co. (Atlanta)	407.3
Power Plants - Atkinson & McDonough	407.0
Atlanta Municipal Incinerator	406.6
Nickajack Creek	403.2
Dobbins A.F.B. S.T.P.	403.2 - 10.5
Cobb-Smyrna S.T.P.	403.2 - 10.0
Smyrna S.T.P.	403.2 - 9.0
Sandy Creek	403.1
Sandy Creek S.T.P. (Atlanta)	403.1 - 0.4
South Cobb Co. S.T.P.	401.3
Fulco S.T.P. (Atlanta)	400.6
American Art Metal Co. (Atlanta)	400.2

TABLE NO. 1a

Reference Point Locations

Chattahoochee River

1964 & 1965 Surveys

Feature	River Mile
Utoy Creek	399.0
Utoy Creek S.T.P. (Atlanta)	399.0 - 1.0
Sweetwater Creek	397.6
Douglasville S.T.P.	397.6 - 1.9
Noses Creek	397.6 - 9.1
Marietta West Side S.T.P.	397.6 - 9.1 - 11
Olley Creek	397.6 - 9
Marietta South Side S.T.P.	397.6 - 9 - 9
Austell	397.6 - 7
U.S.G.S. Gage No. 2-3370	397.6 - 5.5
Camp Creek	391.2
Camp Creek S.T.P. (Atlanta)	391.2 - 0.5
Deep Creek	390.7
Fairburn S.T.P.	390.7 - 6
Georgia Hwy. 92 (Sample Sta.)	389.4
Big Bear Creek	383.5
Palmetto S.T.P.	383.5 - 9
Georgia Hwy. 16 - Whitesburg (Sample Sta.)	368.4
Power Plant _ Yates	366.2

TABLE NO. 1b

Reference Point Locations

Chattahoochee River

1964 & 1965 Surveys

Feature	River Mile
Wahoo Creek	364.2
Newnan East S.T.P.	364.2 - 12
Snake Creek	364.2 - 7.5
Newnan North S.T.P.	364.2 - 7.5 - 1.4
Arnco Village S.T.P.	364.2 - 4.5
Sargent S.T.P.	364.2 - 4
U. S. Hwy. 27 - Franklin (Sample Sta.)	343.1
New River	334.1
Caney Creek	334.1 - 9
Grantville S.T.P. #1	334.1 - 9 - 7
Mountain Creek	334.1 - 9 - 1
Mineral Springs Branch	334.1 - 9 - 1 - 10
Newnan West S.T.P. #1	334.1 - 9 - 1 - 10 - 3
Ga. Hwy. 219 (Aug.1965 Sampling Sta.)	328.0
Yellowjacket Creek	321.9
Grantville #2	321.9 - 19
Hogansville S.T.P. & Raw Sewage	321.9 - 16
Aug. 1965 Sample Sta.	321.9 - 13.2
Shoal Creek	321.9 - 6
Beach Creek	321.9 - 6 - 1
La Grange Hogansville Rd. S.T.P.	321.9 - 6 - 1 - 3
U.S.G.S. Gage No. 2-3390	321.9 - 5.5

TABLE NO. 1c

Reference Point Locations

Chattahoochee River

1964 & 1965 Surveys

Feature	River Mile
La Grange (Raw)	321.9 - 3.6
Co. Rd. S 2098 (Sample Sta.)	321.9 - 1.3
Georgia Hwy. 109 - nr. La Grange (Aug.'65 Samp.Sta.)	321.5
Georgia Hwy. 238 - Nr. La Grange (Sample Sta.)	316.2
Wehadkee Creek	314.5
Guss Creek	314.5 - 10
West Point - above Water Works (Sample Sta.)	306.7
Osligee Creek	306.5
Kellem Hill Creek	306.5 - 8
Sampling Station	306.5 - 0.2
U.S.G.S. Gage No. 2-3395	306.4
West Point Water Intake (New)	306.4
West Point Sewage (Raw)	306.3 to 305.3
State Line	305.2
Lanett Industrial Water Supply	305.1
Lanett Domestic Water Supply (Sample Sta.)	304.9
Lanett Mill, Dye & Bleachery (Lanett)	304.9
Lanett Sewers (Raw Dom. & Ind. W.)	304.5
Airport (Sample Sta.)	302.4
Near Airport (Aug.'65 Sample Sta.)	302.35

TABLE NO. 1d

Reference Point Locations

Chattahoochee River

1964 & 1965 Surveys

Feature	River Mile
Long Cane Creek	302.3
Callaway Mill (La Grange)	302.3 - 21
Blue John Creek	302.3 - 11
Callaway Mill	302.3 - 11 - 5
La Grange Blue John S.T.P.	302.3 - 11 - 4
Georgia Hwy. #403 (Sample Sta.)	302.3 - 1.7
Langdale Dam (Sample Sta. in the pool)	300.0
Langdale Mill	300.0
Langdale - Shawmut S.T.P.	299.9
Flat Shoals Creek	296.5
Turkey Creek	296.5 - 20.5
Riverview Dam (Sample Sta. in the pool)	296.2
Riverview Mill	296.2
Riverview Sewage	296.1
Mountain Oak Creek	289.6
U.S.G.S. Gage No. 2-3405	289.6 - 5
Lake Harding (Sample Sta.)	289.3
Osanippa Creek	289.2
Fairfax Mill (Lanett)	289.2 - 8.25
Fairfax S.T.P.	289.2 - 8
Lantuck Mill (Lanett)	289.2 - 5.5
Co. Rd. (Sample Sta.)	289.2 - 4

TABLE NO. 1e

Reference Point Locations

Chattahoochee River

1964 & 1965 Surveys

Feature	River Mile
Lake Harding above Dam (Aug. '65 Sample Sta.)	285.8
Bartletts Ferry Dam	285.6
Goat Rock Dam	279.8
Oliver Dam (Sample Sta.)	270.5
Columbus Sanitary & I. W. Sewers	269.9 to 260.8
Phenix W. W. Intake (Sample Sta.)	269.4
North Highlands Dam	269.2
City Mills Dam	268.5
Eagle & Phenix Dam	267.7
Dillingham Bridge (Sample Sta.)	267.7
U.S.G.S. Gage No. 2-3415	267.2
Phenix City S. T. P.	264.3
Columbus S.T.P.	261.9
Buoy 309 above Upato Creek (Sample Sta.)	258.1
Fort Benning #1 S.T.P.	257.7
General Eddy Bridge (Sample Sta.)	253.3
Fort Benning #2 S.T.P.	252.7
Buoy 275 above Oswichee Creek (Sample Sta.)	249.7
Fort Benning - Harmony Church S.T.P.	248.7
Buoy 255 River Bend Park (Sample Sta.)	241.8

TABLE NO. 1f

Reference Point Locations

Chattahoochee River

1964 & 1965 Surveys

Feature	River Mile
Buoy 214 above Bluff Creek (Sample Sta.)	231.9
Omaha (Sample Sta.)	227.7
Buoy 190 Florence Landing (Sample Sta.)	223.2
Above Eufaula (Sample Sta.)	214.8
Buoy 92 above Eufaula (Sample Sta.)	208.2
Bridge at Eufaula (Sample Sta.)	203.5
Eufaula Outfall Sewer	203.2
Below Eufaula (Sample Sta.)	192.4
Walter F. George Lock & Dam	182.5

TABLE NO. 2

Domestic Water Supply Sources

Chattahoochee River
Buford, Ga. to Fort Gaines, Ala.

JURISDICTION	Location River Mile	Volume (Million Gallons Per Day) Average Day	Maximum Day
Gwinnett County	445.3	1.6	2.5
DeKalb County	432.8	25.9	44.6
Cobb County	418.0	14.2	20.3
Atlanta, Ga.	408.2	83.0	109.0
La Grange, Ga.	322.9	2.3	-
West Point, Ga.	306.4	0.6	-
Lanett, Ala.	304.9	2.0	3.5
Columbus, Ga.	270.5	18.0	35.0
Phenix City, Ala.	269.4	1.8	3.2
		149.4	

TABLE NO. 3

Electric Power Generation

Chattahoochee River
Buford, Ga. to Fort Gaines, Ala.

Power Plant	Power Company	Location River Mile	Generating Capacity (KW)	Cooling Water MGD	Cooling Water cfs
	HYDRO POWER GENERATING PLANTS				
Buford	Corps of Engrs.	456.1	86,000	-	-
Morgan Falls	Ga. Power & Light	420.4	16,800	-	-
Langdale	Ga. Power & Light	300.0	1,040	-	-
Riverview	Ga. Power & Light	296.2	480	-	-
Bartlett's Ferry	Ga. Power & Light	285.6	65,000	-	-
Goat Rock	Ga. Power & Light	279.8	26,000	-	-
Oliver	Ga. Power & Light	270.5	60,000	-	-
North Highlands	Ga. Power & Light	269.2	30,000	-	-
Eagle Phenix	Eagle Phenix	267.7	4,100	-	-
Walter F. George	Corps of Engrs.	182.5	130,000	-	-
			419,420		
	STEAM-ELECTRIC GENERATING PLANTS				
Atkinson	Ga. Power & Light	407.0	240,000	432	668
Jack McDonough	Ga. Power & Light	407.0	490,000	393	608
Yates	Ga. Power & Light	366.2	550,000	592	916
			1,280,000	1,417	2,192

TABLE NO. 4

SOURCES OF SEWAGE

Chattahoochee River and Tributaries

1964 Estimates

JURISDICTION	Type of Sewer System	TYPE OF TREATMENT	BACTERIAL LOADS				OXYGEN DEMAND LOADS			
			Sewered Population	% Bact. Removed By Treatment	DISCHARGED TO WATERCOURSE BPE	% of Total	P.E. Before Treatment	% Removed By Treatment	DISCHARGED TO WATERCOURSE P.E.	% of Total
GEORGIA										
MARIETTA										
East Side	S	Secondary + CL. (H.R. Tr.F.)	15,000	99	150	-	15,000	80	3,000	0.4
South East	S	Secondary + CL. (Std. Tr.F.)	15,000	99	150	-	15,000	90	1,500	0.2
West Side	S	Secondary + CL. (Std. Tr.F.)	10,000	99	100	-	10,000	90	1,000	0.1
South Side	S	Secondary + CL. (Std. Tr.F.)	10,000	99	100	-	10,000	90	1,000	0.1
MARIETTA TOTAL			50,000	99	500	0.1	50,000	87	6,500	0.8
DOBBINS A.F. BASE	S	Secondary	12,000	90	1,200	0.3	12,000	85	1,800	0.2
COBB-SMYRNA	S	Secondary + CL. (Std. Tr.F.)	16,500	99	160	-	16,500	95	820	0.1
SMYRNA	S	Secondary + CL. (Std. Tr.F.)	5,000	95	250	-	5,000	60	2,000	0.2
SO. COBB COUNTY PL.		Secondary + CL. (Rated Aer.)	5,000	99	50	-	5,000	95	250	-
DOUGLASVILLE	S	Primary (Imhoff Tk.)	5,000	25	3,750	0.8	5,000	15	4,250	0.5
AUSTELL	S	Primary	1,250	50	620	0.1	1,250	33	830	0.1
COBB CO. SUBDIVISIONS	S	Secondary (Oxidation Ponds)	10,000	99	100	-	10,000	95	500	0.1
ATLANTA										
Clayton Pl.	S+C	Primary	396,330	40	238,000	50.0	760,000	32	520,000	63.8
Sandy Creek	S	Primary	8,570	50	4,300	0.9	9,000	40	5,400	0.7
Fulco	S	Primary	1,000	50	500	0.1	1,600	40	960	0.1
Utoy Creek	S+C	Primary	58,810	50	29,400	6.2	59,000	54	26,000	3.2
Camp Creek	S	Primary	20,390	50	10,200	2.1	20,000	40	12,000	1.5
ATLANTA TOTAL			485,100	42	282,400	59.3	849,600	34	564,360	69.3

TABLE NO. 4a(Contd.)

SOURCES OF SEWAGE

Chattahoochee River and Tributaries

1964 Estimates

JURISDICTION	Type of Sewer System	TYPE OF TREATMENT	BACTERIAL LOADS				OXYGEN DEMAND LOADS			
			Sewered Population	% Bact. Removed By Treatment	DISCHARGED TO WATERCOURSE BPE	% of Total	P.E. Before Treatment	% Removed By Treatment	DISCHARGED TO WATERCOURSE P.E.	% of Total
GEORGIA										
FAIRBURN	S	Secondary (Imhoff & Tr.Filter)	930	75	230	-	930	40	560	0.1
PALMETTO	S	Primary (Imhoff)	950	40	570	0.1	950	20	760	0.1
ARNCO	S	Primary (Septic Tk.)	800	25	600	0.1	800	10	720	0.1
NEWNAN										
East Plant	S	Secondary	3,000	90	300	0.1	3,000	80	600	0.1
North Plant	S	Secondary	2,000	90	200	-	2,500	80	500	0.1
West Plant	S	Secondary	2,500	90	250	0.1	1,750	81	330	-
NEWNAN TOTAL			7,500	90	750	0.2	7,250	80	1,430	0.2
SARGENT	S	Primary	1,500	50	750	0.2	800	38	500	0.1
GRANTVILLE										
Plant No. 1	S	Primary (Septic Tk.)	750	25	560	0.1	750	10	680	0.1
Plant No. 2	S	Primary (Septic Tk.)	450	25	340	0.1	450	10	400	-
GRANTVILLE TOTAL			1,200	25	900	0.2	1,200	10	1,080	0.1
HOGANSVILLE										
Raw Sewage	S	None	3,000	0	3,000	0.6	3,000	0	3,000	0.3
Septic Tank	S	Primary (Septic Tk.)	500	25	380	0.1	500	10	450	0.1
HOGANSVILLE TOTAL			3,500	3	3,380	0.7	3,500	2	3,450	0.4
LA GRANGE										
Hogansville Rd. Stp.		Secondary	1,000	90	100	-	1,000	90	100	-
Raw Sewage	S	None	6,000	0	6,000	1.3	6,000	0	6,000	0.8
Blue John Stp.	S	Secondary	20,000	90	2,000	0.4	20,000	90	2,000	0.2
LA GRANGE TOTAL			27,000	70	8,100	1.7	27,000	70	8,100	1.0

TABLE NO. 4b (Contd.)

SOURCES OF SEWAGE

Chattahoochee River and Tributaries

1964 Estimates

JURISDICTION	Type of Sewer System	TYPE OF TREATMENT	BACTERIAL LOADS				OXYGEN DEMAND LOADS			
			Sewered Population	% Bact. Removed By Treatment	DISCHARGED TO WATERCOURSE		P.E. Before Treatment	% Removed By Treatment	DISCHARGED TO WATERCOURSE	
					BPE	% of Total			P.E.	% of Total
GEORGIA										
WEST POINT	S&C	None	3,900	0	3,900	0.8	3,900	0	3,900	0.5
COLUMBUS										
Raw Sewage	S&C	None	118,000	0	118,000	24.8	(2) 158,000	0	158,000	19.4
Treatment Plant (1)	S&C	Primary	32,000	0	32,000	6.7	32,000	41	18,000	2.2
COLUMBUS TOTAL			150,000	0	150,000	31.5	190,000	7	176,000	21.6
FORT BENNING (1)										
Plant No. 1	S	Primary + Cl_2	19,600	99.99	1	-	19,600	51	9,600	1.2
Plant No. 2	S	Primary + Cl_2	16,400	99.99	2	-	16,400	54	7,500	0.9
Harmony Church Plant (3)	S	Secondary (Act. Sl.+Pond)	14,700	99.99	2	-	14,700	97	420	0.1
FORT BENNING TOTAL			50,700	99.99	5	-	50,700	65	17,520	2.2
SUBTOTAL - STATE OF GEORGIA			837,830	45	458,215	96.1	1,241,380	34	795,330	97.7

TABLE NO. 4c (Contd.)

SOURCES OF SEWAGE

Chattahoochee River and Tributaries

1964 Estimates

JURISDICTION	Type of Sewer System	TYPE OF TREATMENT	BACTERIAL LOADS: Severed Population	% Bact. Removed By Treatment	DISCHARGED TO WATERCOURSE: BPE	% of Total	OXYGEN DEMAND LOADS: P.E. Before Treatment	% Removed By Treatment	DISCHARGED TO WATERCOURSE: P.E.	% of Total
ALABAMA										
LANETT(1)	S	None	4,320	0	4,320	0.9	4,320	0	4,320	0.5
LANGDALE-SHAWMUT(1)	S	None	1,190	0	1,190	0.2	1,190	0	1,190	0.1
RIVERVIEW(1)	S	None	280	0	280	0.1	280	0	280	0.1
FAIRFAX(1)	S	Primary (Imhoff Tk.)	870	0	870	0.2	870+	0	870	0.1
PHENIX CITY(1)	S	Secondary + CL.(Tr.Filter)	28,700	94	1,770	0.4	28,700	92	2,300	0.3
EUFAULA	S	None	10,000	0	10,000	2.1	10,000	0	10,000	1.2
SUBTOTAL - STATE OF ALABAMA			45,360	59	18,430	3.9	45,360	58	18,960	2.3
TOTAL - GEORGIA & ALABAMA			883,190	46	476,645	100.0	1,286,740	37	814,290	100.0

(1) Loads and removals based on plant records, survey tests, etc.

(2) Includes estimated 40,000 PE industrial waste in the 4.0 MGD industrial waste flow entering municipal sewers. Total Est. Sewage Flow = 22.0 MGD.

(3) Activated sludge plant effluent contains 1,700 PE of 5-day BOD. Assume 75% additional treatment in existing pond; - equals 420 PE remaining.

General Notes:

Type of Sewer systems are identified by the following symbols: S = Separate Sanitary Sewers; C = Combined Sanitary and Storm Sewers.

BPE = Bacterial Population Equivalent, i.e., 1,000 BPE represents the number of total coliform bacteria normally present in raw sewage from a 1,000 population community.

PE = Oxygen Demand Population Equivalent, i.e., 1.0 PE = 0.167 pounds of 5-day BOD.

ESTIMATED BACTERIAL REMOVALS: 50% Removal By Primary Plants, without chlorination
90% Removal By Secondary Plants, without chlorination
99% Removal By Secondary Plants with chlorination
(Above percentages reduced for overloaded plants)

ESTIMATED REMOVAL OF 5-DAY BOD - OXYGEN DEMAND LOADS: 33% Removal By Primary Plants
60% Removal By High Rate Trickling Filters
90% Removal By STD. Rate Trickling Filters
95% Removal By Activated Sludge
(Above estimates adjusted up or down for under or overloaded plants)

TABLE NO. 5

Sewage & Industrial Waste Loads
(Discharged to the Water Course)
Chattahoochee River & Tributaries
1964 Estimates

	Bacterial Load		Oxygen Demand	
	BPE	% of Total	PE	% of Total
GEORGIA				
Sewage				
Marietta	500	0.1	6,500	0.6
Dobbins A.F.B.	1,200	0.3	1,800	0.2
Cobb-Smyrna	160	-	820	0.1
Smyrna	250	-	2,000	0.2
So. Cobb Co.	50	-	250	-
Douglasville	3,750	0.8	4,250	0.4
Austell	620	0.1	830	0.1
Cobb Co. Subdiv.	100	-	500	-
Atlanta	282,400	59.3	564,360	54.3
Fairburn	230	-	560	-
Palmetto	570	0.1	760	0.1
Newman	750	0.2	1,430	0.1
Arnco	600	0.1	720	0.1
Sargent	750	0.2	500	-
Grantville	900	0.2	1,080	0.1
Hogansville	3,380	0.7	3,450	0.3
La Grange	8,100	1.7	8,100	0.8
West Point	3,900	0.8	3,900	0.4
Columbus	150,000	31.5	176,000	16.9
Ft. Benning	5	-	17,520	1.7
Subtotal Sew.	458,215	96.1	795,330	76.4
Industrial Waste				
Sonoco Products, Atlanta, Ga.			20,000	1.9
Municipal Incinerator, Atlanta, Ga.			5,200	0.5
Callaway Mills, La Grange, Ga.			24,000	2.3
Muskogee Mill, Columbus, Ga.			16,000	1.6
West Point Mfg., Columbus, Ga.			16,000	1.6
Reeves Bros., Columbus, Ga.			16,000	1.6
Subtotal Ind.Waste			97,200	9.5
TOTAL - Georgia Sewage & Ind. Waste			892,530	85.9

TABLE NO. 5a

Sewage & Industrial Waste Loads

(Discharged to the Water Course)

Chattahoochee River & Tributaries

1964 Estimates

	Bacterial Load		Oxygen Demand	
	BPE	% of Total	PE	% of Total
ALABAMA				
Sewage				
Lanett	4,320	0.9	4,320	0.4
Langdale-Shawmut	1,190	0.2	1,190	0.1
Riverview	280	0.1	280	-
Fairfax	870	0.2	870	0.1
Phenix City	1,770	0.4	2,300	0.2
Eufaula	10,000	2.1	10,000	1.0
Subtotal Sew.	18,430	3.9	18,960	1.8
Industrial Waste				
Lanett Mill & Bleachery, Lanett, Ala.			79,000	7.6
Fairfax Mill, Lanett, Ala.			48,750	4.7
Lantuck Mill, Lanett, Ala.			290	-
Subtotal Ind. Waste			128,040	12.3
TOTAL - Alabama Sewage & Ind. Waste			147,000	14.1
TOTAL SEWAGE	476,645	100.0	814,290	78.3
TOTAL INDUSTRIAL WASTE			225,240	21.7
GRAND TOTAL	476,645	100.0	1,039,530	100.0

General Notes:

(1) Figures represent load in final effluent where treatment is provided.
(2) Domestic sewage from industries considered as part of the community sanitary sewage loads.
(3) BPE = Bacterial Population Equivalent - i.e. 1,000 BPE represents the number of total coliform bacteria present in raw sewage from a 1,000 population community.
(4) PE = Oxygen Demand Population Equivalent - i.e. 1.0 PE = 0.167 pounds 5-day B.O.D.
(5) - (dash) indicates less than 0.1% of the total load.

TABLE NO. 6

Total Coliform Bacteria - MPN/100 ml

Chattahoochee River & Tributaries

Oct.-Nov. 1964 Survey - Atlanta to Lake Harding

River Mile	No. of Samples	Mean Density at 50% Probability	Max. Density Exceeded 10% of Time	Min. Density Exceeded 90% of Time	
					CHATTAHOOCHEE RIVER
					⟸ S Marietta E. STP enters through Sope Cr. (416.1)
					" S.E. " " " " Rottenwood Cr. (412.1)
408.2	42	2,800	13,000	360	W ⟹ At Atlanta Mun. Water Supply Intake
					⟸ S Atlanta, Cobb & Douglas Co., & Fairburn STP's enter direct & through Nickajack, Sweetwater & Deep Creeks.
389.4	20	2,400,000	10,000,000	360,000	
					Ga. Hwy. 92
					⟸ S Palmetto STP enters through Big Bear Creek (383.5)
368.4	22	460,000	3,000,000	120,000	
					U. S. Hwy. 27A (Ga. 16) at Whitesburg
					⟸ S Newnan E. & N., Arnco & Sargent STP's enter through Wahoo Creek (364.2)
343.1	37	160,000	1,000,000	25,000	
					U. S. Hwy. 27 at Franklin
					⟸ S Newnan W., & Grantville #1 STP's through New River (334.1)
					W ⟹ LaGrange Water Supply Intake (329.9)
					⟸ S Grantville #2, Hogansville & LaGrange Treated & Untreated Sew. through Yellowjacket Creek (321.9)
316.2	15	55,000	200,000	11,000	
					Ga. Hwy. 238 West of LaGrange
306.7	15	37,000	160,000	5,000	
					0.3 Mile above West Point Water Supply Intake
					W ⟹ West Point Water Supply Intake (306.4)
					⟸ S West Point Sewers (306.3 to 305.3)
305.2	45	50,000	130,000	11,000	
					Ga.-Ala. State Line
					W ⟹ Lanett Mun. Water Supply Intake (304.9)
					⟸ S Lanett Sewers (304.5)
302.4	15	57,000	320,000	5,000	
					Airport Sampling Station
					⟸ S LaGrange Blue John STP enters through Long Cane Creek (302.3)
300.0	15	40,000	240,000	6,000	
					Pond above Langdale Dam
					⟸ S Langdale-Shawmut Sewers (299.9)
296.2	14	40,000	110,000	15,000	
					Pond above Riverview Dam
					⟸ S Riverview Sewers (296.1)
269.3	14	14,000	60,000	3,400	
					Upper Lake Harding
					⟸ S Fairfax Sewers enter through Osanippa Creek
					TRIBUTARIES
321.9-1.3	11	46,000	118,000	18,000	Yellowjacket Creek, Co. Rd. S-3089
306.5-0.2	3	320	760	140	College Creek
302.3-1.7	15	38,000	159,000	3,000	Long Cane Creek
269.2-4.0	14	39,000	98,000	15,000	Osanippa Creek

GENERAL NOTES:

The Mean, Max., and Min. Densities were determined from logarithmic probability plots of measured densities.

Coliform Densities at the Atlanta Water Supply Intake at River Mile 408.2 were obtained from probability plots of the October 1963 through September 1964 Water Year Data provided by the Public Health Service Water Surveillance System.

Samples were not tested for Fecal Coliform during this survey.

TABLE NO. 7

Total Coliform Bacteria - MPN/100 ml

Chattahoochee River & Sewage Plant Effluents

June - July 1965 Survey - Walter F. George Reservoir Area

River Mile	Station Ident.	Buoy No.	No. of Samples	Mean Density at 50% Probability		Max. Density Exceeded 10% of Time		Min. Density Exceeded 90% of Time			
				Number	% Fecal Coliforms	Number	% Fecal Coliforms	Number	% Fecal Coliforms		
											CHATTAHOOCHEE RIVER
270.5	A	-	14	800	2	4,000	-	170	-	W⟹	Columbus Water Supply Intake
										⟸S	Columbus Sewers enter
269.4	B	-	13	3,600	1	20,000	8	1,800	-	W⟹	Phenix City Water Supply Intake
										⟸S	Columbus & Phenix City STP's (261.9 & 264.3)
258.1	C	309	13	490,000	37	2,200,000	32	380,000	9		Above Upatoi Creek
										⟸S	Fort Benning STP #1 (257.7)
253.3	D	-	13	490,000	26	7,000,000	7	130,000	27		General Eddy Bridge
										⟸S	Fort Benning STP #2 (252.7)
249.7	E	275	14	290,000	13	2,100,000	31	39,000	15		Above Oswichee Creek
										⟸S	Fort Benning Harmony Church STP (248.7)
241.8	F	255	14	80,000	19	390,000	14	16,000	25		River Bend Park
231.9	G	214	13	8,000	22	45,000	13	1,400	25		Above Bluff Creek
223.2	H	190	11	1,800	28	12,000	10	560	21		Florence Landing
214.8	37	-	9	600	4	3,200	9	60	1		
208.2	I	92	3	250	8	330	-	< 20	-		
203.5	36	-	17	740	8	20,000	6	30	10		U. S. Hwy. 82 Bridge at Eufaula
										⟸S	Eufaula Sewers (203.2)
192.4	34	-	8	8	-	80	-	1	-		
											Walter F. George Lock & Dam (182.5)
											SEWAGE TREATMENT PLANT EFFLUENTS
264.3	PC	387	3	2,200,000	31	3,500,000	31	1,100,000	45	⟸S	Phenix City STP Effluent
261.9	CO	368	4	220,000,000	30	540,000,000	30	57,000,000	21	⟸S	Columbus STP Effluent
257.7	FB #1	305	8	300	9	5,000	20	20	-	⟸S	Fort Benning STP #1 Effluent
252.7	FB #2	279	7	1,500	9	8,000	19	< 20	-	⟸S	Fort Benning STP #2 Effluent
248.7	FB #3	-	1	4,900	4	-	-	-	-	⟸S	Fort Benning Harmony Church STP Effluent

TABLE NO. 8

Fecal Coliform Bacteria - MPN/100 ml

Chattahoochee River & Sewage Plant Effluents

June - July 1965 Survey - Walter F. George Reservoir Area

River Mile	Station Ident.	Buoy No.	No. of Samples	Mean Density at 50% Probability		Max. Density Exceeded 10% of Time		Min. Density Exceeded 90% of Time			
				Number	% of Tot.Coli.	Number	% of Tot.Coli.	Number	% of Tot.Coli.		
											CHATTAHOOCHEE RIVER
270.5	A	-	13	20	2	-	-	< 20	-	W ⇒	Columbus Water Supply Intake
										⇐ S	Columbus Sewers enter
269.4	B	-	13	50	1	1,600	8	< 20	-	W ⇒	Phenix City Water Supply Intake
										⇐ S	Columbus & Phenix City STP's (261.9 & 264.3)
258.1	C	309	13	180,000	37	700,000	32	33,000	9		Above Upatoi Creek
										⇐ S	Ft. Benning STP #1 (257.7)
253.3	D	-	12	130,000	26	470,000	7	35,000	27		General Eddy Bridge
										⇐ S	Ft. Benning STP #2 (252.7)
249.7	E	275	13	37,000	13	650,000	31	6,000	15		Above Oswichee Creek
										⇐ S	Ft. Benning Harmony Church STP (248.7)
241.8	F	255	13	15,000	19	55,000	14	4,200	25		River Bend Park
231.9	G	214	12	1,800	22	6,000	13	350	25		Above Bluff Creek
223.2	H	190	11	500	28	1,200	10	120	21		Florence Landing
214.8	37	-	9	25	4	300	9	2	1		
208.2	I	92	3	20	8	-	-	< 20	-		
203.5	36	-	17	56	8	1,200	6	3	10		U. S. Hwy. 82 Bridge at Eufaula
										⇐ S	Eufaula Sewers (203.2)
192.4	34	-	8	< 2	-	< 20	-	< 2	-		
											SEWAGE TREATMENT PLANT EFFLUENTS
264.3	PC	387	3	680,000	31	1,100,000	31	490,000	45	⇐ S	Phenix City STP Effluent
261.9	CO	368	7	65,000,000	30	160,000,000	30	12,000,000	21	⇐ S	Columbus STP Effluent
257.7	FB #1	305	8	27	9	1,000	20	< 20	-	⇐ S	Ft. Benning STP #1 Effluent
252.7	FB #2	279	7	140	9	1,500	19	< 20	-	⇐ S	Ft. Benning STP #2 Effluent
248.7	FB #3	-	1	170	4	-	-	-	-	⇐ S	Ft. Benning Harmony Church STP Effluent

TABLE NO. 9

SALMONELLA REPORTS*

(Isolations from the United States)

Rank (June)	Serotype**	No.	Per Cent	Rank (May)
1	S. typhi-murium & S. typhi-murium var. copenhagen	786	36.2	1
2	S. heidelberg	156	7.2	2
3	S. infantis	116	5.3	3
4	S. newport	106	4.9	5
5	S. meleagridis	105	4.8	Not Listed
6	S. saint-paul	76	3.5	8
7	S. enteritidis	74	3.4	4
TOTAL -		1,419	65.3	

Total Salmonella isolated (June) - 2,174

* SOURCE: Excerpt from Salmonella Surveillance Committee Report No. 39, July 30, 1965, Communicable Disease Center, Atlanta, Ga.

** 7 most commonly reported from human sources.

TABLE NO. 10

Salmonella Bacteria

Chattahoochee River & Sewage Plant Effluents

June - July 1965 Survey - Walter F. George Reservoir Area

River Mile	Station Ident.	Buoy No.	Coliform Bacteria Mean Density MPN/100 ml Total	Fecal	Salmonella		
							CHATTAHOOCHEE RIVER
207.5	A	-	800	20	S. montevideo S. muenchen	W ⇨	Columbus Water Supply Intake
269.4	B	-	3,600	50	S. heidelberg	⇦ S W ⇨	Columbus Sewers enter Phenix City Water Supply Intake
258.1	C	309	700,000	180,000	S. new brunswick S. derby S. heidelberg	⇦ S	Columbus & Phenix City STP's (261.9 & 264.3) Above Upatoi Creek
						⇦ S	Fort Benning STP #1 (257.7)
						⇦ S	Fort Benning STP #2 (252.7)
241.8	F	255	80,000	15,000	S. typhimurium S. heidelberg S. saint-paul S. infantis	⇦ S	Fort Benning Harmony Church STP (248.7) River Bend Park
231.9	G	214	8,000	1,800	Swab removed by others		Above Bluff Creek
223.2	H	190	1,800	500	S. typhimurium S. montivedo S. infantis		Florence Landing
208.2	I	92	330	20	Swab removed by others	⇦ S	54 Mi. Below Columbus STP - 5 Mi. Above Eufaula Eufaula Sewers (203.2) Walter F. George Lock & Dam (182.5)
							SEWAGE TREATMENT PLANTS
264.3	PC	387	2,200,000	680,000	S. newport	⇦ S	Phenix City STP Effluent
261.9	CO	368	220,000,000	65,000,000	S. typhimurium var. copenhagen S. heidelberg S. derby	⇦ S	Columbus STP Effluent
257.7	FB #1		300	27	None Recovered	⇦ S	Fort Benning STP #1 Effluent
252.7	FB #2		1,500	140	None Recovered	⇦ S	Fort Benning STP #2 Effluent

TABLE NO. 11

5-day B.O.D., D.O., & Temperature

Chattahoochee River

River Mile	Location	Field No.	5-Day B.O.D.(mg/l) No. of Samples	Avg.	Max.	Min.	D.O. (mg/l) No. of Samples	Avg.	Max.	Temp.(°C.) Min.	Avg.	Max.	Min.
	CHATTAHOOCHEE RIVER												
343.1	Franklin (U.S. Hwy. 27)	C-1	7	2.7	4.2	1.8	14	7.0	9.8	8.2	16	20	12
316.2	West of LaGrange (U.S. Hwy. 238)	C-2	7	2.2	3.2	1.4	20	8.8	9.8	7.9	16	18	13
306.7	Above West Point (Above W.W. Intake)	C-3	7	2.9	5.8	1.4	20	9.1	9.8	8.6	16	19	14
305.2	State Line (Below West Point Sewers)	C-4	25	2.1	3.6	1.4	45	9.1	9.7	8.5	16	17	14
302.4	Airport Station (Below Lanett Sewer)	C-5	12	4.0	5.4	1.2	16	8.8	9.5	8.3	16	18	14
300.0	Langdale Dam Pond	C-6	12	2.8	4.4	1.4	20	8.7	9.7	7.9	16	19	13
296.2	Riverview Dam Pond	C-7	10	3.5	6.6	1.8	20	9.4	9.9	8.7	16	18	14
289.3	Lake Harding (Upper End)	C-8	12	2.6	4.4	1.6	15	9.4	10.0	8.5	16	18	15
	TRIBUTARIES												
321.9-1.3	Yellowjacket Creek	YJ-1	6	4.3	13.2	2.0	13	9.5	10.0	8.9	16	17	12
306.5-0.2	Osligee Creek	G-1	3	2.4	4.2	1.2	4	9.7	10.0	9.2	15	16	14
302.3-1.7	Long Cane Creek	L-1	6	3.7	5.0	1.5	15	6.5	7.9	5.3	14	18	11
289.2-4.0	Osanippa Creek	S-1	6	7.9	14.4	2.4	15	7.3	9.7	5.6	15	17	12

TABLE NO. 12

Dissolved Oxygen & Temperature

Chattahoochee River
Walter F. George Reservoir

June - July 1965 Survey

DISSOLVED OXYGEN - mg/l

RIVER MILE

Depth (feet)	253.3	249.7	241.8	231.9	227.1	223.2	203.5	195.0	188.2	Depth (feet)
3	6.2	6.5	7.1	7.2	7.8	8.0	8.0	7.7	8.9	3
10	6.0	6.3	7.0	6.7	6.4	5.7	5.0	6.0	8.9	10
15			6.5							15
20	6.0	6.3		6.3	5.4	5.0	2.6	1.7	2.5	20
30				6.0	5.2	4.9	2.2	1.2	0.5	30
40				5.8	5.1	4.7	1.5	1.0	0.4	40
45					5.0		1.2	0.7	0.3	45

TEMPERATURE

DEGREE C.

Depth (feet)	253.3	249.7	241.8	231.9	227.1	223.2	203.5	195.0	188.2	Depth (feet)
3	27.0	27.1	28.0	28.0	29.0	29.0	29.5	29.9	29.7	3
10	27.0	27.0	28.0	28.0	28.0	27.0	28.0	29.2	29.7	10
15			28.0							
20	27.0	27.0		27.5	27.1	27.0	26.1	27.0	27.0	20
30				27.3	27.0	27.0	26.0	25.8	25.3	30
40				27.0	27.0	27.0	25.2	25.1	25.0	40
45					27.0		25.2	25.0	24.9	45
50							25.5	25.4	25.0	50
60							25.0	25.4	25.0	60
69							24.9			69
70								25.0	24.7	70
75								24.5		75
80									24.5	80
90									24.0	90
100									23.7	100

TABLE NO. 13

Time of Passage

Chattahoochee River System

June - July 1965 Survey

LOCATION	River Mile	ELAPSED TIME - DAYS High Flow Release	Low Flow Release
Phenix City STP	264.3	0.00	0.00
Columbus STP	261.9	0.04	0.19
"C" above Upatoi Creek	258.1	0.15	0.43
"D" General Eddy Bridge	253.3	0.34	0.58
"E" Buoy 275	249.7	0.44	0.65
"F" River Bend Park	241.8	1.23	1.46

TABLE NO. 14

Stream Discharge
Chattahoochee River System
Alabama-Georgia

MEAN DAILY DISCHARGE - 1963-1964 WATER YEAR	Max.	Min.	Mean
Chattahoochee River at Atlanta	18,000	782	3,769
Chattahoochee River at West Point	53,500	1,470	7,625
Chattahoochee River at Columbus	110,000	800	10,420

DISCHARGES DURING OCT.-NOV. 1964 SURVEY	Max. Record	Min. Record	Mean During Survey
Chattahoochee River at Franklin	7,150	2,120	3,945
Chattahoochee River at West Point	7,900	3,080	4,960
Yellow Jacket Creek	293	147	213
Long Cane Creek	93	48	60
Osanippa Creek	182	107	132

RELEASES FROM OLIVER DAM AT COLUMBUS
(During Monday, June 28, 1965 to Saturday, July 3, 1965 Survey)

	CFS
Max. Instantaneous Release	12,160
Min. " "	1,240
Max. Mean Daily Discharge	7,046
Min. " " "	2,845
Avg. " " "	4,965